Public Environment Report ï Ecological Thinning Trial in New South Wales River Red Gum Forests

Appendix 1 ï Experimental Design and Monitoring Plan

NSW GOVERNMENT | Office of Environment & Heritage

Ecological Thinning Trial in New South Wales and Victorian River Red Gum Forests

Appendix 1 – Experimental Design and Monitoring Plan

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And

Parks Victoria.

EXECUTIVE SUMMARY

New River Red Gum reserves were gazetted as reserves in both New South Wales (NSW) and Victoria in 2010, totalling more than 200 000 ha and containing the largest stand of River Red Gums (*Eucalyptus camaldulensis)* in the world. Adaptive management will be employed to address management issues in these reserves, and where appropriate consistent management actions will be employed in both states. In recommending gazettal of the parks, both the NSW Natural Resources Council and the Victorian Environmental Assessment Council recommended an ecological thinning trial be undertaken within an adaptive management framework to address the management problems of high stem density and canopy dieback in stands of River Red Gum forest. This document details the background, conceptual underpinnings and characteristics of the experimental design and monitoring plan for implementing an ecological thinning trial in River Red Gum forests in Barmah National Park in Victoria and Millewa Group of Murray Valley National Park in NSW. Ecological thinning entails the removal of some trees in a stand for the purposes of enhancing habitat features.

Background to management problems. It is proposed that River Red Gum forests would have existed as a mosaic of Open Forest interspersed with small areas of dense even aged stands prior to European settlement. High density stands may have established in gaps created by the death of large old trees in the wake of a flood or fire that stimulated recruitment. The duration and frequency of floods would have acted to limit widespread recruitment of high density stands. In concert with altered flood regimes, management for commercial timber extraction has altered these natural processes, resulting in widespread establishment of high stem density stands and a paucity of large trees in the landscape. Characteristic features of these high density stands are lack of key habitat features essential to the regional persistence of indigenous species, including hollow bearing trees and coarse woody debris. In addition, extensive canopy dieback (i.e. % dead canopy) has been documented in River Red Gum forests, particularly following the recent drought, which may have detrimental effects on canopy dependent fauna as well as the persistence of River Red Gum populations.

Conceptual underpinnings (process model) for an ecological thinning trial. A process model is under development for River Red Gum forests, which will quantify the natural and anthropogenic processes that have contributed to the management problems of high stem density and canopy dieback, as well as document characteristic features of alternative states (forms) the forest may take. The model proposes that the process primarily responsible for maintenance of high stem density stands is competition for water (and, to a lesser degree, other resources). In high stem density stands, trees appear to be exhibiting ‘contest competition’ (*sensu* Nicholson 1954), in which no (or very few) individuals are obtaining sufficient resources for growth. Ecological thinning may be an appropriate management action to reduce competition amongst individuals for water and other resources, which may promote the growth of retained trees and have subsequent effects on development of key habitat features (including hollows, understorey plant structure and diversity, canopy dieback and coarse woody debris) and the persistence of indigenous species. Published studies on the effects of ecological thinning and silvicultural thinning lend support for this proposition. The process model also documents a risk of total stand death in the absence of management.

Main features of the ecological thinning experimental design. A joint NSW and Victorian ecological thinning trial will be implemented in Barmah-Millewa forests to determine the efficacy of employing ecological thinning to ameliorate conservation concerns in high stem density stands. The two main features of the experimental design are stratification factors and treatments, both of which are essentially indicators of competition for water amongst trees. Sites will be stratified across three categories of initial stem density (higher densities are assumed to be under more intense competition); and across two categories of Site Quality (which is a coarse indicator of surface and ground water availability). Three treatments will be employed: control (no management), moderate thinning treatment (average 7 m spacings) and heavy thinning treatment (average 15 m spacings). Moderate thinning spacings approximate the widest spacing that might be employed in a silvicultural setting; heavy thinning spacings are based on the approximate crown diameter of a large (>1m diameter at breast height (dbh)) *Eucalyptus camaldulensis* tree. All hollow bearing trees, trees with >40cm dbh and standing dead trees with >20cm dbh will be retained, and spacings of retained trees will thus be heterogeneous. Coarse woody debris will be retained on all sites to a level of 45 tonnes/ha. A randomised block design will be employed, in which each site will consist of a cluster of three 9 ha plots: a control plot, a moderate thinning plot and a heavy thinning plot. A total of 22 sites (66 plots) will be located approximately equally in Barmah and Millewa, with more replicates in the highest stem density class. The total area that will be affected by thinning treatments, including moderate and heavy thinning plots, will be 216 ha in Millewa and 180 ha in Barmah.

Location	Site Quality 1 <200 stems	Site Quality 1 200-400 stems	Site Quality 1 >400 stems	Site Quality 2 <200 stems	Site Quality 2 200-400 stems	Site Quality 2 >400 stems	Total
Millewa (NSW)	1	2	3	1	2	3	12
Barmah (Vic)	1	2	2	1	2	2	10
Total	2	4	5	2	4	5	22

Hypotheses and monitoring variables. Based on the process model, a series of 17 hypotheses have been generated that describe how site features are expected to change in response to thinning, given initial stem density, Site Quality and treatment. The hypotheses relate to tree populations and forest structure, mammalian and avian diversity and vascular plant diversity. It is proposed that the greatest effects of thinning will be observed in sites for which competition has been reduced to the greatest degree (i.e. Site Quality 1 sites with high initial stem densities, subject to the heavy thinning treatment). In order to evaluate these hypotheses, a monitoring program has been designed to samples site features relevant to each hypothesis at an appropriate spatial and temporal scale. For example, it is hypothesised that ecological thinning will increase the growth rates of retained trees, and the monitoring plan includes recording dbh in 30 permanently marked trees with $\geq$10cm dbh on each 9 ha plot.

Predicted outcomes and outputs of the ecological thinning trial. Pre-thinning monitoring on all sites will commence in May 2012, treatment implementation will likely commence in August 2012, and the first round of post-thinning monitoring will be conducted approximately 6 months after treatments have been implemented. The exact timing of monitoring surveys and treatment implementation will depend on flood events, and monitoring for some variables is season dependent. The outcomes of the ecological thinning trial are expected to

be three-fold. Firstly, this trial provides a template for the implementation of adaptive management involving manipulative experiments, which is likely to be of interest to an international community of managers and scientists alike. Secondly, the trial will improve understanding of dynamics of River Red Gum forest ecosystems, the processes that drive them and the features that characterise them. Thirdly, the trial will deliver practical information about the usefulness of ecological thinning to address the management problems of high stem density and canopy dieback in the context of conservation concerns. This will include information about where in the landscape ecological thinning may be appropriate, and the relative effects of alternative ecological thinning treatments in promoting the persistence of indigenous species in River Red Gum forests.

Contents

1. Introduction

1.1. Document context

This document describes in detail the ecological thinning trial to be undertaken in New South Wales (NSW) and Victorian River Red Gum reserves. In NSW, the ecological thinning trial sits within a broader Adaptive Management framework, which will consider a range of potential management options for management issues in NSW River Red Gum reserves (Table 1.1). Similarly in Victoria, the ecological thinning trial sits within the Victorian Active Forest Health Program, which is based on clearly defined, transparent and scientifically supported ecological objectives and outlines a program of works and measures to actively manage River Red Gum forests (Table 1.1). The ecological thinning trial will be implemented in the Millewa Group of the Murray Valley National Park in NSW and Barmah National Park in Victoria.

Table 1.1. Summary of documents relevant to the NSW and Victorian Ecological Thinning Trial, current document indicated by bold text.

Document type	Scope	Scope	Status	Status
Legislation and statutes	NSW legislative and statutory requirements	Victorian legislative and statutory requirements	Includes National Parks and Wildlife Act 1974	Includes Victorian National Parks Act 1975
Joint approach to adaptive management in NSW and Victorian River Red Gum reserves	—	—	SAC* June 2011 Agenda Item 2.0	SAC* June 2011 Agenda Item 2.0
Overarching adaptive management documents	Conceptual model	Conceptual model	SAC* June 2011 Agenda Item 3.0 (draft)	SAC* June 2011 Agenda Item 3.0 (draft)
Overarching adaptive management documents	NSW Adaptive Management Framework	Victorian Active Health Program	NSW OEH (In prep.)	Vic PV (2009)
Adaptive management supporting documents	Mapping stem density and canopy condition	Mapping stem density and canopy condition	Bowen et al. (2012)	Bowen et al. (2012)
Adaptive management	River Red Gum ecosystem	River Red Gum ecosystem	Process model workshop	Process model workshop

Document type	Scope	Scope	Status	Status
supporting documents	process models	process models	documented in Walshe et al. (2011)	documented in Walshe et al. (2011)
Ecological thinning technical documents	**NSW and Victorian Experimental design and monitoring plan**	**NSW and Victorian Experimental design and monitoring plan**	**This document**	**This document**
Ecological thinning technical documents	Independent statistical review	Independent statistical review	Robinson (2011)	Robinson (2011)
Ecological thinning technical documents	Operational plan	Operational plan	In prep. jointly by NSW and Vic.	In prep. jointly by NSW and Vic.
Ecological thinning compliance documents	NSW DECCW (2011) Review of Environmental Factors	Vic Research Permit	NSW Completed	Vic Completed

* SAC: Joint NSW and Victorian River Red Gum Adaptive Management Scientific Advisory Committee (see Section 1.2.4 below)

1.2. Background to River Red Gum reserves

1.2.1. River Red Gum reserve formation

The NSW Adaptive Management Framework includes detailed background to the creation of River Red Gum reserves, a description of past management of vegetation in the reserves, as well as a description of the current status of the reserves. In short, NSW and Victoria independently created River Red Gum reserves in June 2010 (Figure 1.1) on the recommendations of the Natural Resources Commission (NRC 2009a) and Victorian Environmental Assessment Council (VEAC 2008) respectively.

In NSW, more than 100 000 hectares of River Red Gum (*Eucalyptus camaldulensis*) parks were added to the national estate (Figure 1.1). The reserves are mostly contained within the Riverina Bioregion and include National and Regional Parks in the Murray Valley (including the Millewa forest group), the Murrumbidgee Valley, the Lachlan Valley, as well as Murrumbidgee Valley National Park (also known as Yanga National Park). The expansion of the Victorian park system included approximately 140 000 hectares of River Red Gum parks and reserves along Victoria's Murray River corridor, including Barmah and Gunbower National Parks.

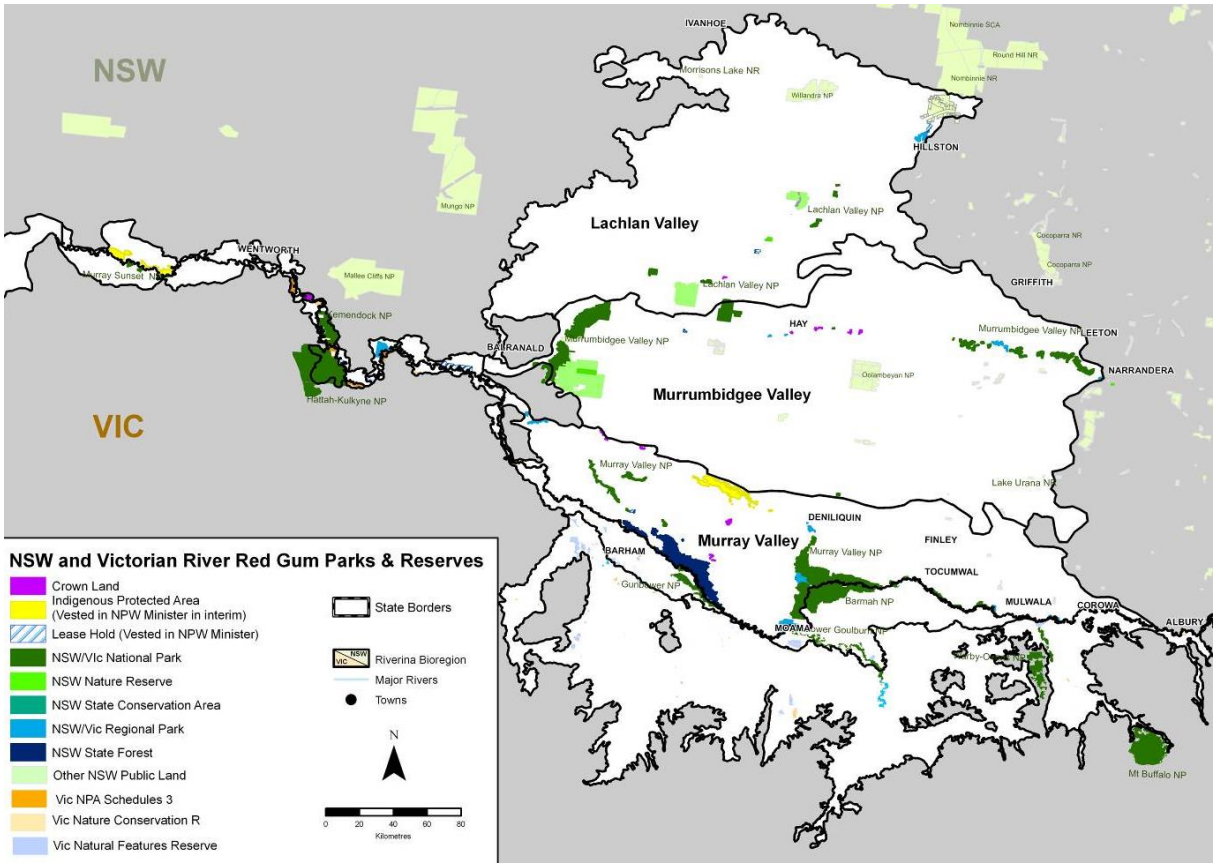


Figure 1.1. River Red Gum Reserves in NSW and Victoria (from Bowen et al. 2012).

The largest tract of River Red Gum dominated vegetation in Australia is now contained within Barmah National Park in Victoria and the Millewa Group of the Murray Valley National Park in NSW (hereafter referred to as Barmah-Millewa). Barmah-Millewa covers 66 000 hectares and is one of six Icon Sites that are part of The Living Murray (TLM) program (MDBA 2009). TLM is a partnership of the New South Wales, Victorian, South Australian, Australian Capital Territory and the Commonwealth governments, coordinated by the Murray-Darling Basin Authority (MDBA). It was established in 2002, and has the long term goal of 'achieving a healthy working River Murray system for the benefit of all Australians'. Permanent monitoring sites have been established in Barmah-Millewa, which are surveyed using standard protocols and reported annually (MDBC 2006).

1.2.2. Dominant vegetation types

Terrestrial vegetation communities in Barmah-Millewa can be considered to fall into three very broad groupings (Figure 1.2; Table 1.2; also see Chesterfield 1986): wetlands, forests and woodlands.

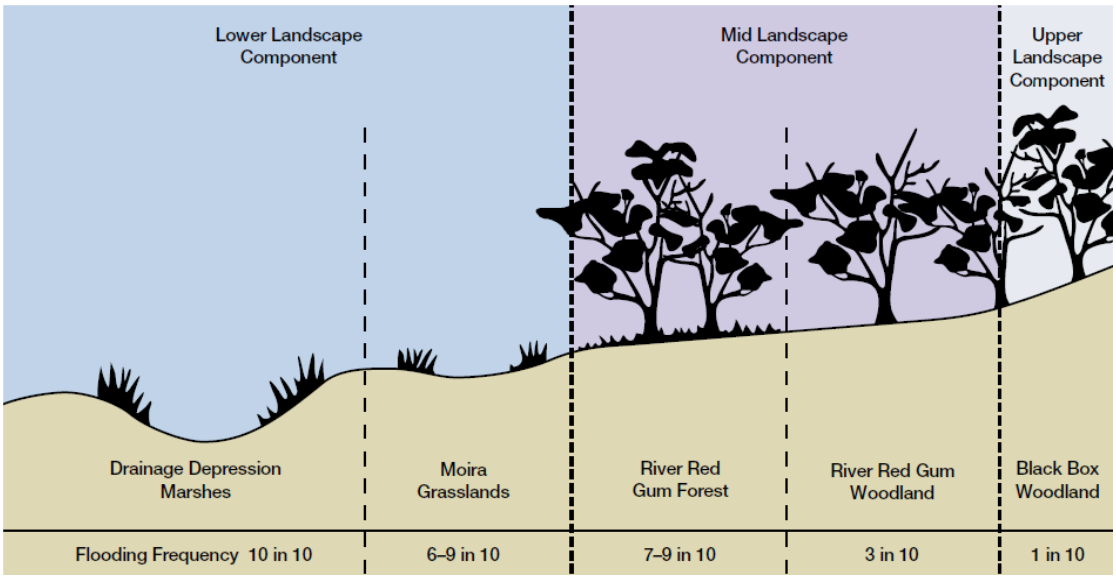


Figure 1.2. Broad vegetation types in relation to flooding frequency and topographical position (from NRC 2009b).

Table 1.2. Broad vegetation types occurring in Barmah-Millewa (from GB CMA 2011).

Vegetation types	Flood regime	Barmah (ha)*	Millewa (ha)**	Total ha (% of total)
Wetlands, swamps and marshes; reedbeds; open grassland (Moira grassland)	These vegetation types are dependent on permanent or semi permanent inundation.	1 381	3 441	4 822 (7.3%)
River Red Gum Forest	Vegetation dependent on periodic inundation. Lower elevations support taller and denser forests	16 617	26 181	42 798 (64.8%)
River Red Gum Woodland	Flood tolerant understorey, dependent on irregular, intermittent inundation.	9 711	4 002	13 713 (20.8%)
River Red Gum / Black Box woodland	Flood tolerant understorey, dependent on relatively rare inundation.	1 063	2 919	3 982 (6.0%)
Total	—	29 457	36 543	66 000

GB CMA (2011) states: * Data sourced from DSE (2008) ** Data sourced from GHD (2009)

Mapping undertaken by OEH has combined existing mapping to produce a consistent map across NSW and Victoria (Bowen et al. 2012, Figure 1.3).

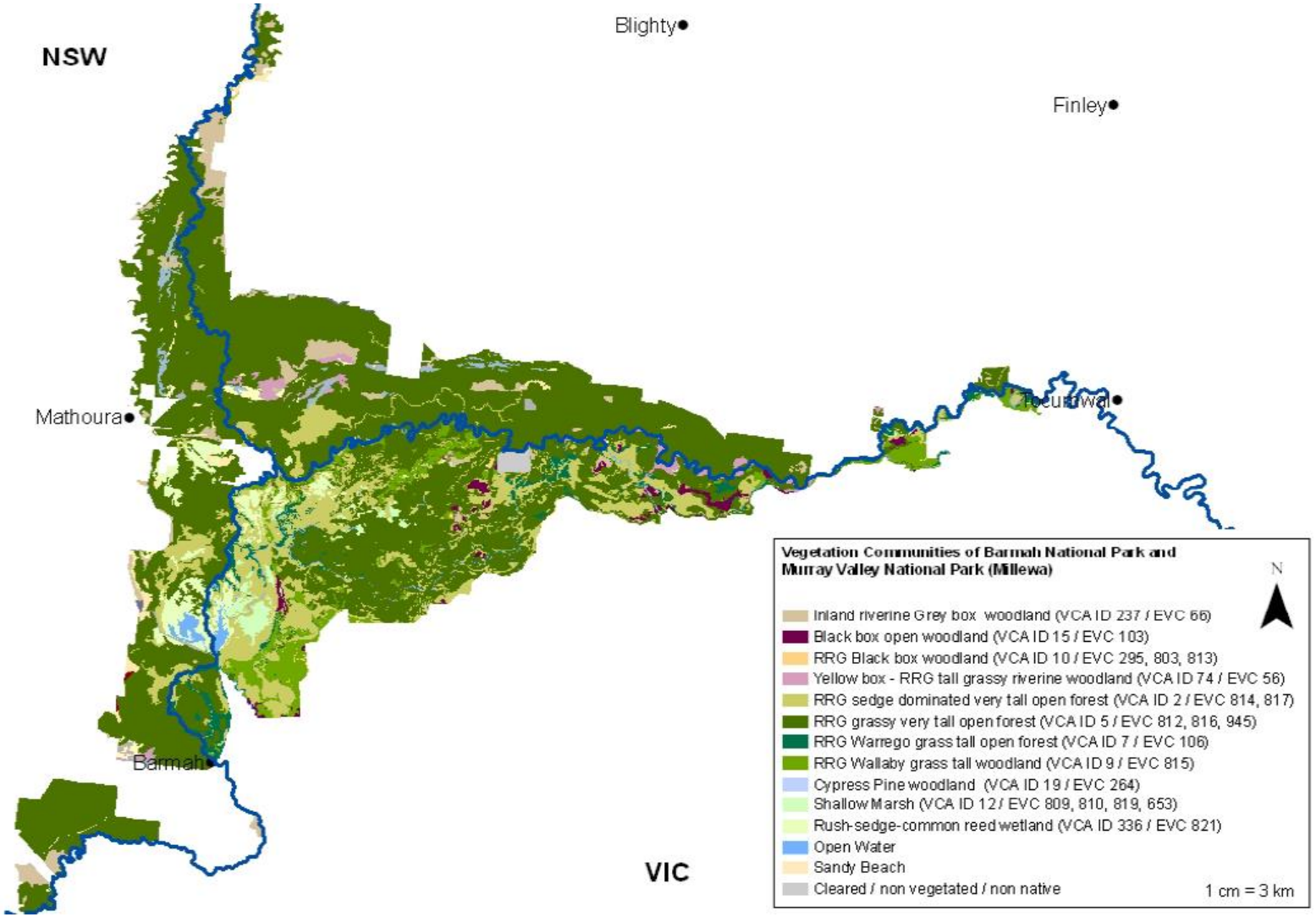


Figure 1.3. Vegetation community map of Barmah National Park (Victoria) and the Millewa Group of Murray Valley National Park (NSW). From Bowen et al. 2012.

1.2.3. Previous management

Aboriginal people inhabited River Red Gum forests for over 50,000 years and have a spiritual connection with the land and water. NSW and Victorian River Red Gum reserves were managed for timber production from the mid 1800s, primarily using single tree or small-group selection techniques (Di Stefano 2001). Grazing by cattle, sheep and rabbits since the mid-late 1800s is known to have impacted River Red Gum ecosystems (Chesterfield 1986; Robertson and Rowling 2000). River regulation substantially altered the extent, frequency, timing and duration of floods in the Murray Valley since the construction of the Hume Dam in 1935 (Chesterfield 1986; Bren 1988). The mean annual flow of the Murray-Darling Basin's river system is presently less than half of the long-term mean under natural conditions (MDBMC 1995), as are flows onto the floodplain upstream of the Millewa forests (NRC 2009b).

1.2.4. Collaborative governance to implement adaptive management

In October 2010, the State of Victoria entered into a Traditional Owner Land Management Agreement with the Yorta Yorta people, to establish the Yorta Yorta Traditional Owner Land Management Board for Barmah National Park (the Barmah Board). The Barmah Board is expected to be established in mid 2012 and will contribute to the adaptive management of Barmah National Park.

As a result of river regulation and land use history, a number of management issues are present in River Red Gum reserves that will be addressed through the NSW Adaptive Management Framework (OEH in prep.) and the Victorian Active Health Program (PV 2009). Each of the broad vegetation groupings (Table 1.2) have particular management issues that require specific approaches and resources. Both VEAC and NRC recommended that an adaptive management approach be used in the management of the newly created River Red Gum reserves (VEAC 2008; NRC 2009a).

The NSW and Victorian state governments are collaborating to implement elements of a common adaptive management strategy in the designated River Red Gum reserves on both sides of the Murray River. A joint NSW and Victorian River Red Gum Adaptive Management Scientific Advisory Committee (SAC) has been established to guide the scientific research underpinning the adaptive management framework. This document describes the implementation of adaptive management to River Red Gum forests in Barmah-Millewa.

1.3. Adaptive management

Adaptive management is a structured iterative process of decision making for on-ground management, with the capacity to gradually reduce uncertainty through monitoring (Duncan & Wintle 2008). Adaptive management is distinct from ‘trial and error’ management in which management is adapted over time in response to the results of previous management actions, conducted on a limited number of sites without adequate replication or stratification. Adaptive management involves creating an experimental framework within which hypotheses about how best to achieve specific objectives are tested. The key elements of an adaptive management strategy are briefly summarized in Table 1.3.

Table 1.3. Summary of key elements of an adaptive management strategy (adapted from Keith et al. 2011; Duncan and Wintle 2008 and Rumpff et al. 2011).

Key adaptive management element	Description
Problem formulation	An unambiguous statement of the management problem that is to be addressed through adaptive management.
Specify objectives / management goals	Specification of the objectives or goals for adaptive management. Ideally, objectives should be specified in terms of the degree of desired change, the expected time frame, and a minimum level of certainty.
Document a process model	A process model documents knowledge, and uncertainty, about natural processes that underpin existing states of the system and that moderate transition from a current to an alternative state. The model thus provides context for potential management interventions that may facilitate transition. The development of a process model may highlight lack of knowledge about a system, and may result in modification of objectives.
Select management options to trial	The process model allows identification of management actions that may complement natural processes, to address the management problem and achieve objectives. Multiple management options may be plausible, and selection criteria can be applied to select the management options that will be trialed. Ideally, selection criteria should spread risks of management failure and improve system responses to management (Keith et al. 2011).
Design and implement an experimental trial	The process model is used as the basis of specifying hypotheses that will be tested, in terms of the expected changes in the variables that characterise alternative states that will be brought about by the chosen management actions. An experimental design is then developed that specifies stratification factors and levels of replication required to address the hypotheses.
Design and implement monitoring plan	Identify variables that have a known relationship with the subjects of the hypotheses, and design a monitoring plan that collects data with sufficient accuracy/precision to address hypotheses, and thereby evaluate the relative merits and limitations of alternate management strategies. It may be necessary to prioritise amongst monitoring variables (and hypotheses) to meet resource and budgetary constraints.
Iterative modification of process model and management	Information from the experimental trial may alter the underlying process model, and stimulate subsequent phases of adaptive management in which objectives are modified; the chosen

Key adaptive management element	Description
strategies	management options are further explored; or a new set of management options is trialled.

1.3.1. Joint NSW and Victorian approach to adaptive management in River Red Gum reserves

The following definitions, visions and goals have been adopted for adaptive management in NSW and Victorian River Red Gum reserves.

Definition of Adaptive Management

The incorporation of an integrated, structured, learning and decision-making process into explicit management actions to achieve a defined vision. Specifically, it is the integration of explicit objectives, project design, implementation, monitoring and evaluation to provide a framework to systematically test assumptions, limit and spread risks, promote learning and supply timely information for the review of management decisions

Vision for Adaptive Management of River Red Gum reserves

To restore resilience and health of River Red Gum systems that are dependant on river and groundwater flows to meet current and future environmental, cultural and socio-economic needs.

Goals to achieve vision

Conserve biological diversity, natural landscapes and processes to improve the health, resilience and ecological function of the River Red Gum floodplain vegetation and associated fauna.

Protect and enhance resources/features/customs that are valued by Aboriginal and other cultures and communities (subject to further determination involving cultural heritage stakeholders & joint managers).

Methods for achieving goals:

1. Applying collaborative adaptive management approaches to manage and improve knowledge about the River Red Gum ecosystem.
2. Collaborating with Aboriginal people, stakeholders and communities in adaptive management activities (subject to further determination).
3. Developing methods to manage the River Red Gum ecosystems to meet socio-economic and environmental responsibilities and legislative requirements.

In response to NRC and VEAC recommendations, the first phase of the joint NSW and Victorian adaptive management program for River Red Gum ecosystems will employ an ecological thinning trial in Barmah-Millewa to address the management issues of stand thickening and canopy dieback in River Red Gum forests. Other phases of adaptive management will address management issues in woodland and wetland vegetation in River Red Gum reserves.

1.4. Problem formulation and management goals

Management problem

The primary management problem is the relatively widespread occurrence of stands of River Red Gum forest that contain high densities of *Eucalyptus camaldulensis* trees and exhibit some canopy dieback. These stands are of conservation concern because they are widespread relative to their likely historical distributions, and they lack a number of site features that are critical for habitat and regional persistence of indigenous species. The nature of the conservation concern for each of the site features in these stands are summarised in Figure 1.3, and are discussed below.

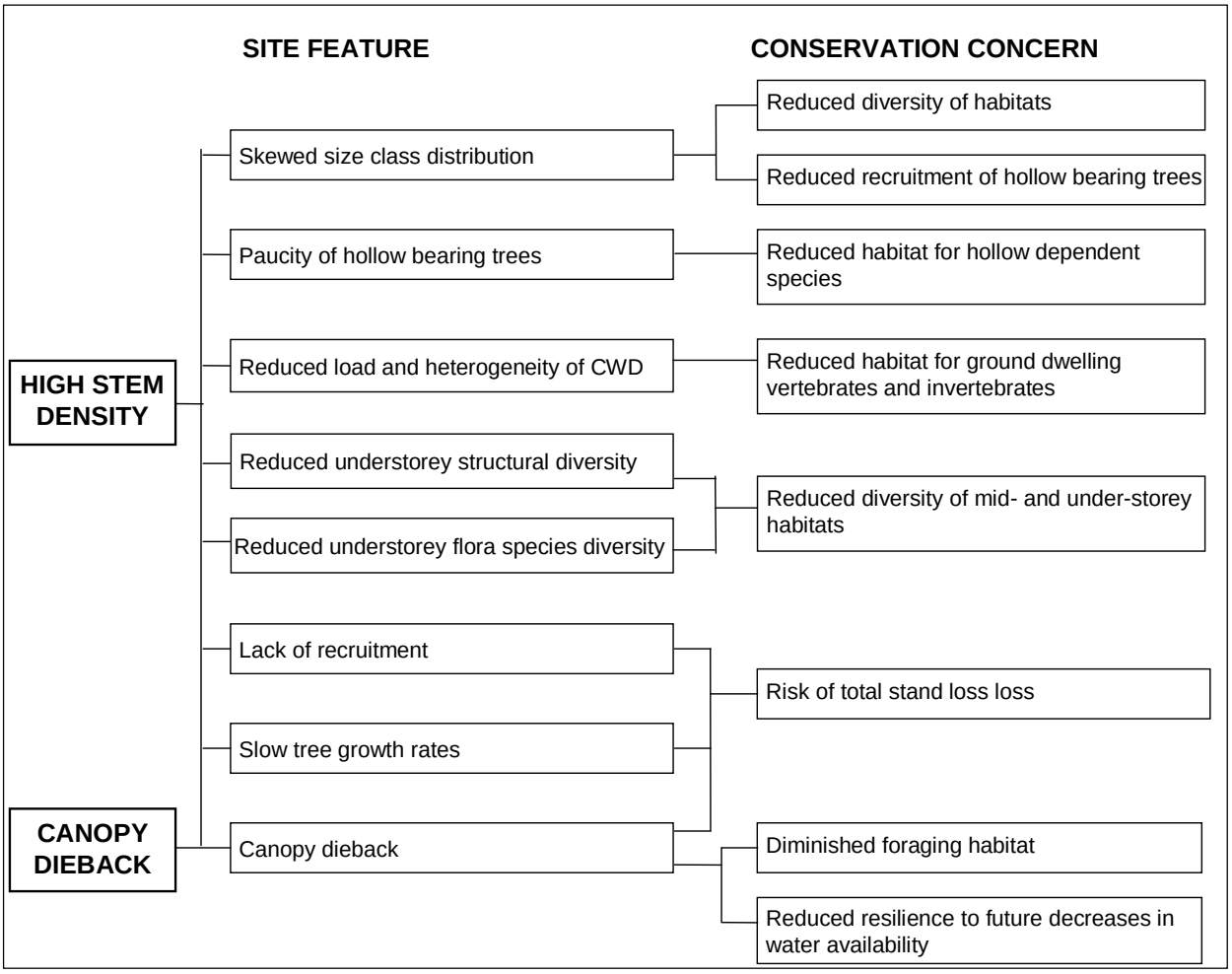


Figure 1.3. Summary of site features and conservation concerns associated with high stem density and canopy dieback in River Red Gum forests.

Management goal

The goal of management is to ameliorate the conservation concerns in high density stands of River Red Gum forests, in particular by increasing the relative abundance of hollow bearing trees in the landscape.

1.4.1. Widespread stand thickening

The following sections provide information about the nature, extent and causes of management problems in River Red Gum forests in NSW and Victorian River Red Gum reserves.

Previous forest structure

Prior to European settlement, forest structure is thought to have been dominated by large, spreading trees, interspersed with a mosaic of mixed-aged and even-aged (high density) patches (Jacobs 1955 cited in Mac Nally et al. 2011). Upstream River Red Gum has been described as predominantly medium open forest, 10-30m tall with 30-45% projective foliage cover (Margules et al. 1990 cited in Cunningham et al. 2007). The understorey has been described as typically having a patchy species-rich ground cover that includes many ephemeral herbs, interspersed with bare ground and scattered shrubs (Keith 2004).

Causal factors influencing stand structure

High density stands of River Red Gums occur because of the nature of the River Red Gum recruitment cycle: in the wake of a flood or fire, thousands of seedlings can germinate (FCNSW 1984). Floods deposit a new layer of nutrient-rich silt on the soil surface and disperse seed throughout the forest. The flush of moisture and nutrients stimulates seed germination. Even-aged cohorts of trees are produced by particular flood events, and often form distinctive patterns that shadow the extent of the high water mark (Keith 2004). Ephemeral herbs and grasses also germinate after flooding, but persist as above-ground plants only for a short time before reverting back to a dormant seed phase (Keith 2004).

Prior to European settlement, widespread seedling establishment stimulated by flood would have been impeded by: a) subsequent or prolonged flooding or wild fires; b) summer drought; c) competition from mature trees within the zone of influence of their crowns (Dexter 1967; Opie 1969, both cited in Di Stefano 2001). Forestry operations, altered flood regimes, livestock grazing and fire suppression removed these natural mechanisms for preventing extensive seedling establishment.

Current forest structure

Dense new forests were generated over extensive areas in the Central Murray region after flood events between the 1840s and the 1970s (Curr 1883 cited in NRC 2009b). Areas that are dominated by even-aged stands of slender ‘poles’ contain few large and hollow bearing trees (Mac Nally et al. 2011). Data from TLM permanent monitoring sites shows size class distributions of trees is skewed towards trees with diameter at breast height <20cm (Figure 1.4).

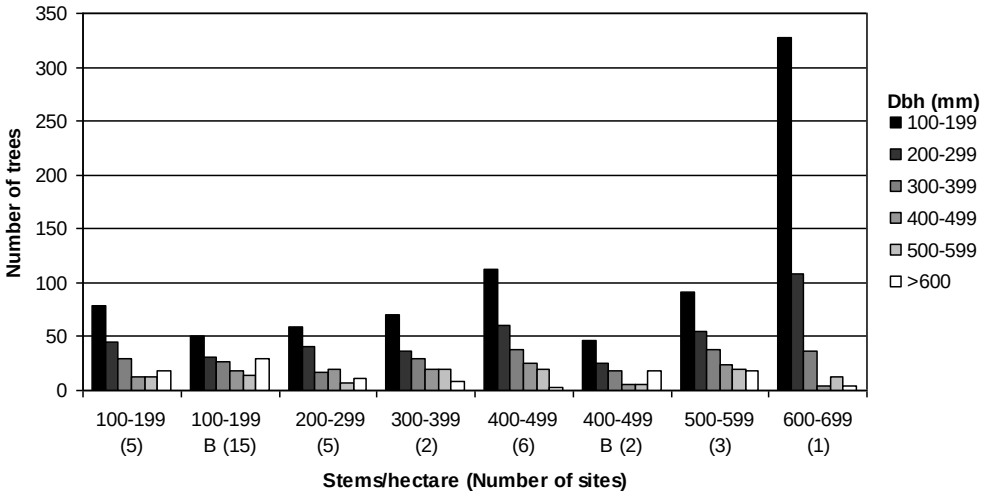


Figure 1.4. Distribution of trees across diameter at breast height (dbh) classes, for stands mapped as different stem densities (stems per hectare). On-ground sites for measuring dbh were 0.25 ha in size. Sites located in Barmah are indicated by a B on the x axis; all other sites were located in Millewa.

Stands with up to 4000 stems per hectare have been recorded in Barmah National Park (Horner et al. 2010). The average stem density in Barmah-Millewa River Red Gum forests is 211 stems per hectare (ranging from 92-452 stems per hectare) (Cunningham pers. comm. 2011). As a consequence of the prevalence of thin straight trees, limb fall has reduced, reducing the abundance and volume of coarse woody debris on the forest floor (Mac Nally et al. 2011).

Recruitment events are now very limited in River Red Gum forests, as flood and fire events that may stimulate regeneration are less frequent, and of lesser duration and extent. Further, existing closely spaced trees create a new contiguous zone of influence and dominate competition for water, nutrient and light resources, thus impeding seedling establishment via competition for scarce resources. It is possible that due to competition for resources, the abundance of reproductive material is diminished.

The extent of dense, even aged stands of trees has increased in River Red Gum forests more than woodlands, which may be due to the greater prevalence of flood-driven episodic recruitment in forests than woodlands. It is likely that a much greater proportion of River Red Gum forests occur as high density (even-aged) stands than would have occurred in the absence of anthropogenic disturbance (Plate 1.1).

Regeneration (plus retained trees) from the early 1970s flooding on Steamer Plain (Barmah)

Even aged regeneration near Grinters Ridge (Barmah)

300 stems per hectare (Millewa)

480 stems per hectare (Millewa)

Photographs by Patrick Piggott and Danielle McAllister.

Plate 1.1. High stem density stands of River Red Gum forest in Barmah and Millewa.

Conservation concerns arising from widespread occurrence of thickened stands

The widespread occurrence of thickened stands of River Red Gum forests is of concern because of:

1. Reduced habitat diversity

Widespread thickened stands may adversely affect the regional persistence of indigenous species through a paucity of key habitat features and a reduction in the diversity of habitats present. The restoration of River Red Gum forests is dependent, in part, on re-establishing a diversity of forest structures (Mac Nally et al. 2011). Characteristics of thickened stands that are of concern for indigenous species' habitat include:

- **Paucity of hollow bearing trees**. The importance of hollows to indigenous fauna is well established (Gibbons and Lindenmayer 1997; Kavanagh and Stanton 2003; Leslie 2005). A benchmark or reference stand of River Red Gum forest exhibiting relatively little evidence of modification post European settlement is expected to contain a minimum of 20 hollow bearing trees per hectare (BioMetric benchmark, DECC 2008), and relatively undisturbed temperate forests are known to contain about 13-27 hollow-bearing trees per hectare (Gibbons and Lindenmayer 2002). Current average densities in NSW River

Red Gum forests are in the order of 6 hollow bearing trees per hectare, of which 33% are classified as dead (NPWS unpublished data). Thomson (undated) found that there were up to an average of 2 live hollow-bearing trees per hectare recorded in fixed growth and sample plots in Barmah. There is concern that the trend will worsen because: the canopy condition of current hollow bearing trees is declining (NPWS unpublished data), making them more vulnerable to collapse; current densities of hollow forming trees are insufficient to replace the current stock of hollow bearing trees (Figure 1.4); diversity of hollow sizes may be limited in regrowth stands.

- **Reduced levels of coarse woody debris** (CWD). CWD is known to provide habitat for invertebrates (Ballinger et al. 2010), ground mammals (Mac Nally and Horrocks 2002; Lada et al. 2008) and some birds (Mac Nally et al. 2001; Mac Nally and Horrocks 2007) in River Red Gum forests. Mean wood densities in Barmah State Forest have been estimated to be 24 tonnes per hectare, compared with an inaccessible 'unmanaged' forest site within Millewa with estimated mean wood density of 125 tonnes per hectare (Robinson 1997, cited in Mac Nally et al. 2002). Mac Nally et al. (2002) recommended an average of 40-50 tonnes per hectare with high variance (patchiness) may be an appropriate objective for biodiversity outcomes.
- **Reduced complexity in vegetation strata** (i.e. a number of layers of overstorey and understorey), which represents a reduced diversity of habitats. Structural heterogeneity among stands is a strong predictor of species diversity at the patch scale (Connell 1978; Petraitis et al. 1989, cited in Mac Nally et al. 2011). The ground cover of River Red Gum forests is typically patchy and species-rich, including many ephemeral herbs, interspersed with bare ground and scattered shrubs (Keith 2004). Structural changes to the forest have shifted the understorey toward a simplified terrestrial flora, in places dominated by weeds (Mac Nally et al. 2011). Removal of large trees and vertical branches has also simplified structural diversity in the overstorey.

2. Risk of stand loss

Widespread thickened stands are of concern because of they indicate a risk of complete tree loss in a stand. Two factors in combination contribute to this risk. Firstly, the tree population in thickened stands may be 'locked', such that trees persist with unappreciable growth rates through to senescence and death. This is akin to a scramble model of competition (Nicholson 1954), in which most, or sometimes all, individuals in a population fail to obtain sufficient resource to survive and reproduce. The growth rates of River Red Gums in Barmah Forest and on Gunbower Island have reportedly decreased by up to 40% over the long dry period after 1996 (Mac Nally et al. 2011). Secondly, lack of recruitment events as described above may result in insufficient new individuals to sustain the population. In concert, these two factors confer a risk that older trees will senesce and die without replacement, and result in complete forest loss (Mac Nally et al. 2011).

3. Time frames

It is postulated that in the absence of active management, self thinning of thickened stands would occur in which some trees may die as a result of competition for water (contest model of competition, in which only some individuals in the population obtain sufficient resource to survive and reproduce (Nicholson 1954)). As a result of self thinning, coarse woody debris volumes would likely increase and gaps for tree recruitment and understorey establishment may be created. Competition for water amongst mature trees would be reduced, and surviving trees may then grow to hollow bearing size. The concern is that this process will take decades to centuries to occur (Vesk et al. 2008), during which time key habitat elements are insufficient in the landscape to support viable populations of indigenous flora and fauna.

1.4.2. Canopy dieback

Canopy condition is defined as the amount of live canopy present relative to the maximal potential canopy, given stand age and natural biotic and abiotic conditions (Cunningham et al. 2007). Canopy dieback occurs when canopy condition declines between time periods. Surveys of the health of *Eucalyptus camaldulensis* forests have shown an apparently substantial decline in tree condition in the lower Murray River during the past 20 years (Margules and Partners 1990; Cunningham et al. 2009a, 2009b). These surveys used qualitative assessments of crown condition from aerial photographs and field observations.

Causative mechanisms for canopy dieback

It is postulated that declining canopy condition is likely to be driven by competition for increasingly scarce water resource (Cunningham et al. 2007). Canopy condition of *Eucalyptus camaldulensis* trees is known to respond to altered water availability over short time frames. During inundation the tree crowns of River Red Gums become much denser and turn a healthy dark-green colour (Bren 1988). On flooding recession River Red Gum crowns quickly shed leaves (Briggs and Maher 1983). Under moisture stress River Red Gum leaf colour becomes a dull yellowish-green and the forest develops a drought-stricken appearance (Bren 1988). In periods of drought the crowns thin substantially (Pook 1986, cited in Bren 1988). Leaf shedding reduces water demand by reducing leaf area. It also reduces heat load under dry conditions when transpiration is reduced (Gibson et al. 1994 cited in Roberts 2001). River Red Gums are also susceptible to extensive defoliation by the Gum-leaf Skeletoniser *Uraba lugens*, particularly in the absence of winter flooding (Campbell 1962).

Current canopy condition

Declining canopy condition has been well documented in River Red Gum forests, particularly since 2003 (Cunningham et al. 2009a, 2009b, 2011). In 2005 an assessment of tree health in River Red Gum forests of the central Murray revealed that 38% of trees were severely stressed, 27% were stressed, 1% were dead and 11% were considered healthy (Jurskis et al. 2005). Cunningham et al. (2010) found little evidence for size-related dieback of *Eucalyptus camaldulensis* and suggested that trees of all sizes were affected by water stress. However, they suggested that the cause of water stress may differ among different-sized trees, with small trees responding to low surface soil moisture and large trees responding to lower availability of groundwater. Contrary to other studies, Cunningham et al. (2010) also found dieback in River Red Gum forests on the was negatively related to stand density and basal area, which they suggested may have been due to higher productivity or younger age of high density stands.

An assessment of Victorian River Red Gum forest health in 2006 revealed around 70% of forests in were in some state of dieback (Cunningham et al. 2009a). Statewide Landcover and Trees Study (SLATS) from 1988 to 2008 was used to observe changes in projected foliage cover indicative of condition and moisture stress in River Red Gum forests of the Riverina Bioregion, which indicated that while forest condition in some parts of the forests was stable, there was an observed overall decline in foliage projected cover over the past 30 years (Pennay 2009).

Conservation concerns arising from canopy dieback

The decline of canopy condition in River Red Gum forests is a concern because:

1. Declining canopy condition is indicative of stress in tree populations. Widespread and prolonged canopy dieback corroborates the existence of the risk of complete tree loss without replacement.
2. Stands with declining canopy condition may be more prone to insect attack by defoliating species such as the Gum-leaf Skeletoniser *Uraba lugens* (Campbell 1962; Stone and Bacon 1994).
3. Poor canopy condition may have flow-on effects for other aspects of the ecosystem, such as decreased foraging habitat for bird and bat species. For example, there is evidence that bat activity is dependent on foliage structure (O'Neill and Taylor 1986). Habitats with sparse foliage will usually support relatively few bat nest sites compared to habitats with a complex vegetation profile and dense foliage (Recher 1991). It is noted, however, that limb fall resulting from canopy dieback may have positive effects on coarse woody debris levels.
4. Declining canopy condition may worsen in the future within reduced water availability under predicted climate change scenarios and increased human demand for water.

1.5. Distribution of stand thickening and canopy dieback in River Red Gum reserves

A mapping project was undertaken in Yanga, Millewa and Barmah National Parks which categorised all River Red Gum forest vegetation into stem density and canopy condition classes (Bowen et al. 2012). Field data was used to establish reference plots for stem density and canopy condition classes. Within mapped forest polygons, randomly located 1 hectare squares were sampled for stem density and canopy condition, using LiDAR (30cm resolution captured in 2008) for Yanga and ADS40 aerial photos (50cm resolution, captured in 2009) for Millewa and Barmah. Where multiple 1 hectare squares sampled within a polygon indicated that stem density varied >100 stems per hectare, or more than one canopy condition class, polygons were split.

The project highlighted substantial differences between Yanga and Millewa in NSW. In particular, canopy dieback in River Red Gum forests in Yanga was more widespread and severe with 47% of River Red Gum forests exhibiting >80% dead canopy. The causative factors for the current status of Yanga are believed to include extensive water delivery infrastructure, which facilitated artificial flooding within levy banks in the past. For these reasons, Yanga was considered to require a different set of goals and management actions to Millewa. Therefore this document is concerned with the management issues of stand thickening and canopy dieback in Millewa and Barmah only.

The majority of the area of both Millewa (77.7%) and Barmah (66.7%) was mapped as intermediate canopy condition (10-40 % dead canopy) in 2010 (Table 1.4). Millewa had almost four times as much area containing high density stands (400-800 stems per hectare) (based on total area) than Barmah (Figure 1.5).

Table 1.4. Current hectares of River Red Gum forests categorised into stem density and canopy condition classes in Millewa (shaded in grey) and Barmah (from Bowen et al. 2012).

Stem density	Millewa % dead canopy				Total	Barmah % dead canopy				Total
	<10	10-40	40-80	>80		<10	10-40	40-80	>80	
< 200	3256	10 109	638	531	**40%**	3434	9895	1808	179	**56.5%**
200−399	1916	7500	416	79	**27%**	2089	5888	822	15	**32.5%**
400−800	981	10 606	145	144	**33%**	622	2284	13	21	**11%**
> 800	0	0	0	0	**0%**	0	0	0	0	**0%**
Total	**6153**	**28215**	**1199**	**754**	**36321**	**6145**	**18067**	**2643**	**215**	**27070**
% of total	**17%**	**77.7%**	**3.3%**	**2%**	'	**22.7%**	**66.7%**	**9.8%**	**0.8%**	'

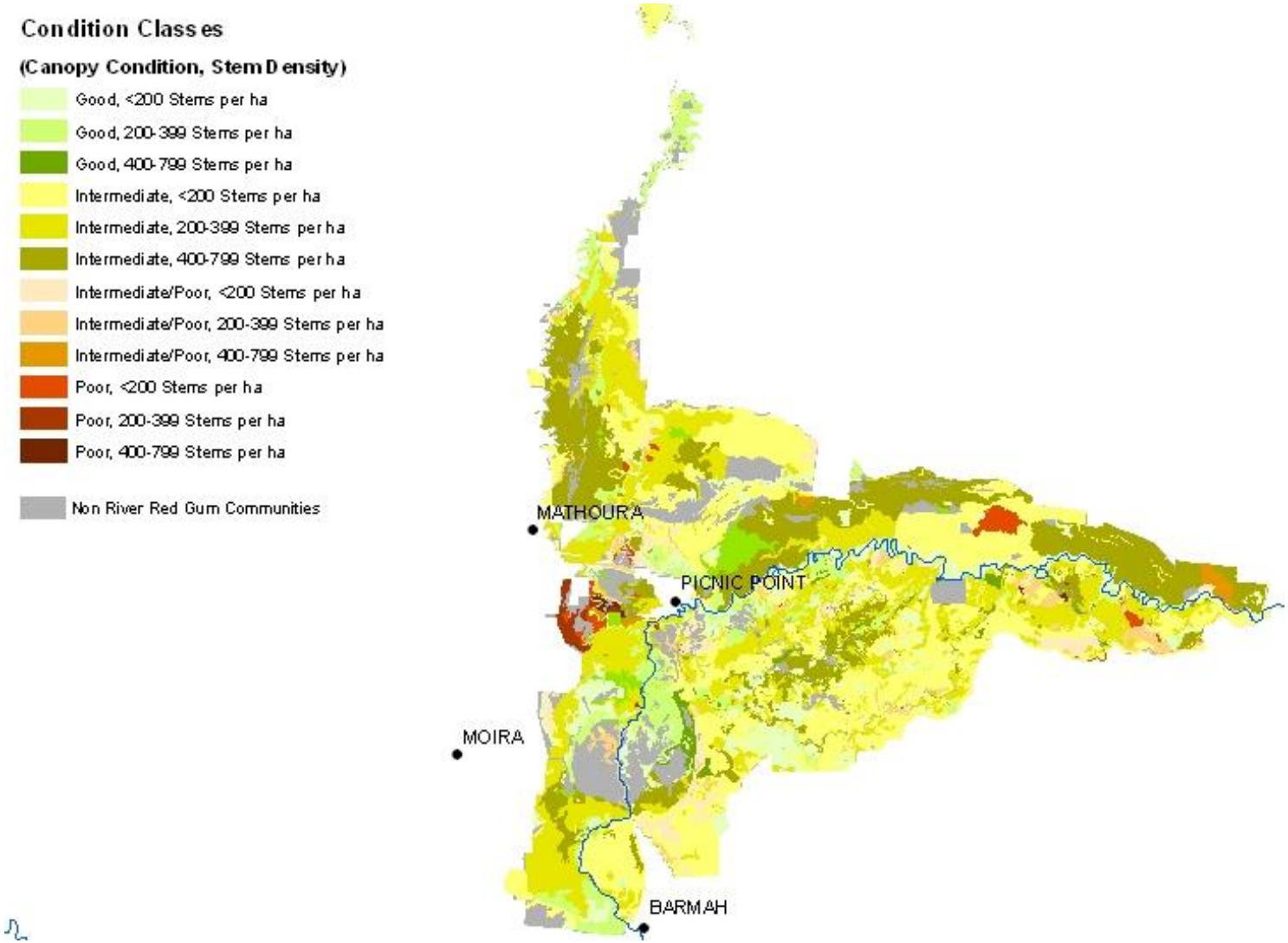


Figure 1.5. Stem density and canopy condition map of River Red Gum forests in Barmah (Vic) and Millewa (NSW) National Parks (from Bowen et al. 2012).

1.6. Water availability: Flood regimes and flooding history

Previous flood regime

Natural flood regimes in the upper Murray were associated with winter and spring rains and snow melt in the Murray headwaters hundreds of kilometres upstream (Bren 1988; Dalton 1990, cited in ANBG 2011). Water passed into adjacent forest when the river exceeded the capacity of the narrowing channel (the Barmah Choke) and flooding may have persisted for periods of five months or more, receding in summer (Bren 1988). It is considered that River Red Gum forests in Barmah-Millewa require: flood duration of 3-5 months; frequency of 4-9 years in 10; a maximum of 4 years between floods; and river flows at Yarrawonga Weir (upstream of Barmah-Millewa) of 15-35GL/day (GB CMA 2011).

Causal mechanisms for change

Substantial changes to the flood regime in Barmah-Millewa occurred subsequent to the construction of the Hume Dam in 1935, such that flood regimes are now characterised by summer floods of a reduced duration and volume (Bren 1988).

In the context of a continuing drying climate, availability of water to River Red Gum forests is primarily controlled by environmental flows (planned or adaptive environmental water allocations released from major water storage facilities). Summer floods result from environmental water delivery that is timed with the release of water for irrigation. Control of flows in the Murray River is the jurisdiction of the Murray Darling Basin Authority (GB CMA 2011). The minimum operating strategy of the current Environmental Water Management Plan is to deliver 25 GL/day (d/s from Yarrawonga Weir) for at least 2 years in every 10, for a duration of 30 days (GB CMA 2011, p. 42).

Current flood regime

Inland rivers of the Murray Darling basin are now in a state of drought (as defined by river levels) for more than 61 years in every 100, compared with 5 years per 100 under natural conditions. Analysis of flood data at Yarrawonga Weir upstream of the Barmah-Millewa forests found that flows onto the floodplain have reduced by approximately 50 per cent in comparison with pre-development flows (NRC 2009a, p.20).

Effects of altered flood regime

Stands of River Red Gum are intimately associated with the surface flooding regime of the watercourses and related ground water flow (ANBG 2011; Cunningham et al. 2011). The species is a profligate and opportunistic water user, and this is a contributing factor to the maintenance of water tables at depth (Dalton 1990, cited in ANBG 2011). Dexter (1967, cited in Bacon et al. 1993) demonstrated that the dense surface root system of mature River Red Gum trees extended at least 20m from the trunk. Field observations suggest River Red Gums can survive 2-4 years of continuous flooding before showing signs of stress (Bren 1987; Roberts and Marston 2000).

Canopy dieback has been observed in River Red Gum forests under favourable groundwater conditions, suggesting that River Red Gum floodplain forests require adequate rainfall and flooding and cannot be sustained by ground water alone (Cunningham et al. 2009a). Significant correlations have been reported between distance from waterway (a possible indicator of moisture stress) and trunk diameter increment, leaf area, and % leaf area lost to herbivory in *Eucalyptus camaldulensis* (Stone and Bacon 1994).

Drought survival mechanisms in *Eucalyptus camaldulensis* are postulated to be: sparse but large roots that extend at least 10m below the surface (which would not supply sufficient water for rapid growth) (Bacon et al. 1993); extensive leaf fall under dry conditions (Briggs and Maher 1983); and the allelopathic effects of River Red Gum leaves (del Moral and Muller 1970) which reduce competition for moisture by inhibiting the understorey.

Changes in seasonal patterns of flooding are found to have significant impacts on floodplain ecosystems and biogeochemical cycles (eg. Kingsford 2000; Robertson et al. 2001). Changes in flood regime have been reported to have the following effects on River Red Gum forests:

- Reduced tree growth rate and accelerated mortality. In River Red Gum forests in Millewa, decreased flood frequency (from 2 to 1 to 0 per year) resulted in increased mean River Red Gum leaf areas (of 13.2, 12.2 and 11cm^2, respectively) (Bacon et al. 1993; see also Stone and Bacon 1994). Also, decreased flood frequency significantly decreased relative growth rate of trees up to 22.5m from the edge of the floodwater (Bacon et al. 1993).
- Less water being available for regeneration and seasonal growth (ANBG 2011).
- Greater dependence of River Red Gum trees on shallow ground water where available, which cannot sustain them for long dry periods (Cunningham et al. 2011). Canopy dieback increased with increasing groundwater depth in the upper Murray (Cunningham et al. 2011).
- Altered flood regimes have had other indirect effects on River Red Gum vegetation dynamics: forest flooding, particularly in late winter, is a key factor in controlling the Gum-leaf Skeletoniser (Campbell 1962).

1.6.1. Measuring water availability

Both surface water and ground water contribute to water availability for River Red Gum forests:

- Groundwater in Barmah-Millewa is predominantly fresh (Cunningham et al. 2011). The mean groundwater depth from bores in Barmah-Millewa forest was 9.0 m+/-0.4 m in 1990, and 11.0 m +/- 0.5 m in 2006 (Mac Nally et al. 2011).
- Hydrodynamic modelling of surface water flows was conducted as part of The Living Murray program in 2005 (Water Technology 2005), and subsequently updated and recalibrated using LiDAR (Water Technology 2009). The model was further validated by the flood event of 2010-2011, which reproduced the observed flood extents from derived satellite imagery and matched available flow hydrographs along the Murray River, Edward River and Gulpa Creek (Water Technology 2011).

Site Quality is a coarse indicator of water availability that is based on stand height in the following categories: SQ1 >34m; SQ 2 21-34m; SQ3 <21m. Site quality reportedly has a strong relationship with both frequency of surface flooding and access to groundwater (FCNSW 1984). Soil studies conducted in the River Red Gum forests of the Central Murray Region found that the quality class of the River Red Gum forests showed a close correlation with the depth to the watertable (i.e. SQ1 <6m; SQ2 3-9m; SQ3 >9m), suggesting the higher quality stands receive water via lateral percolation from the main stream (FCNSW 1984).

Site Quality mapping is available for both Millewa and Barmah (Figure 1.6, Table 1.5). In NSW, height was measured as the dominant height at maturity by Forest Commission of NSW in 1954. In Victoria, height was measured as the dominant height of trees comprising the most abundant crown form in the 1990s as part of the Statewide Forest Resource Inventory (SFRI). Some stands in Barmah contain younger regrowth forest, which have been

classified as Site Quality 3 because regrowth trees are the most abundant crown form, but may also contain a taller stratum of older trees. In these stands, where ‘height of the overstorey’ (also measured SFRI) is greater than the ‘most abundant crown form’, Site Quality has been re-classified to make it more consistent with NSW Site Quality mapping.

Table 1.5. Summary of the distribution of Site Quality classes in Barmah and Millewa.

Site Quality	Height	Barmah Area (ha)	Barmah %	Millewa Area (ha)	Millewa %
Site Quality 1	>34m	8851	29	9596	26
Site Quality 2	21-34 m	1558	52	21870	60
Site Quality 3	<21 m	5660	19	4966	14

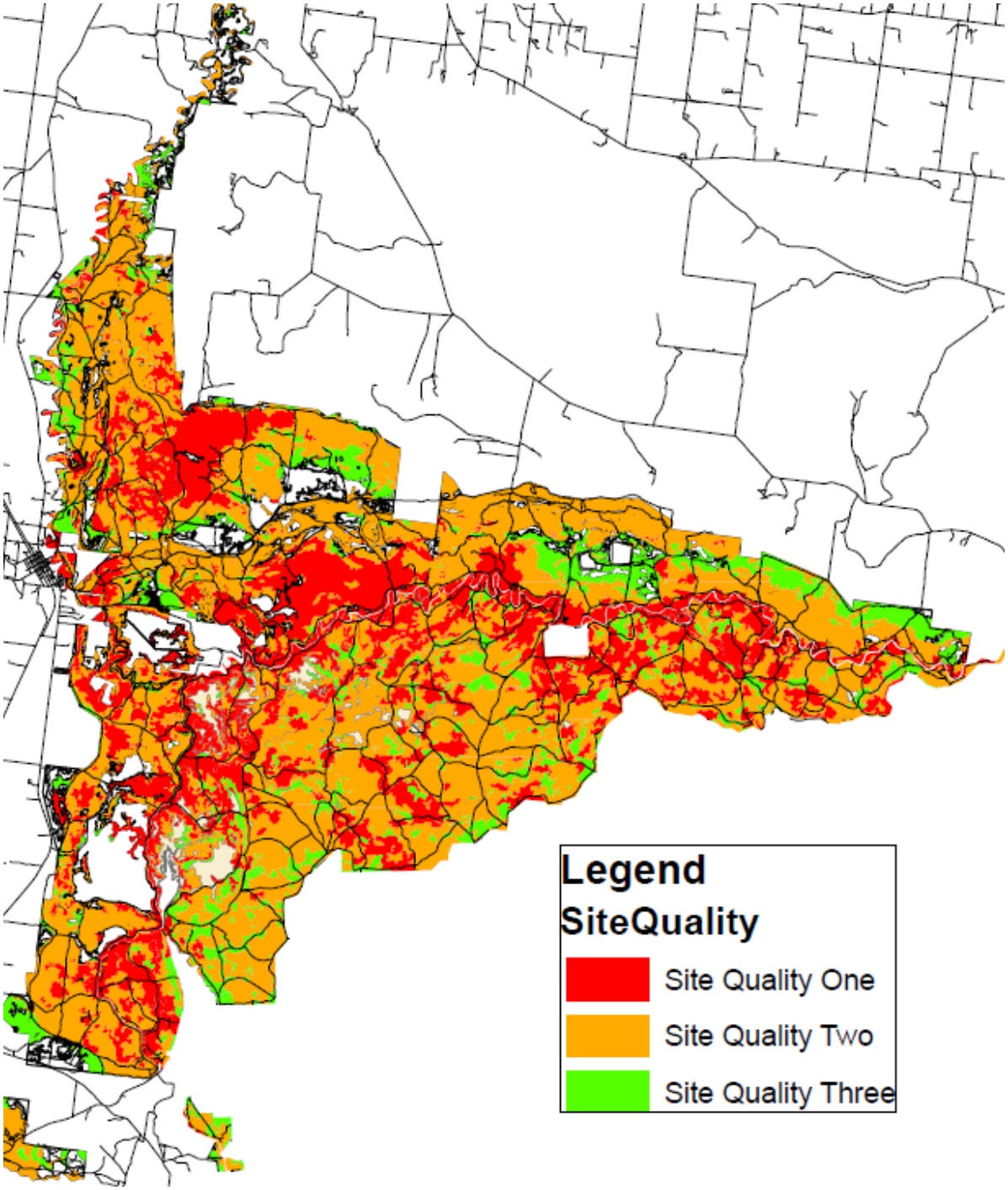


Figure 1.6. Site Quality mapping based on Forest Commission NSW mapping (1954) in Millewa and Statewide Forest Resource Inventory mapping (1990s) in Barmah.

1.7. Process model

A process model for River Red Gum ecosystems is currently in development, which will document current understanding of the mechanisms that affect on-ground features, and provide a framework for applying adaptive management in River Red Gum reserves. The process model is likely to take the form of a quantitative state and transition model, in which: alternative states of River Red Gum vegetation communities are defined by specified state variables; the natural and anthropogenic processes mediating transition from a current state to an alternative state are specified by process variables; and the probability of transitioning

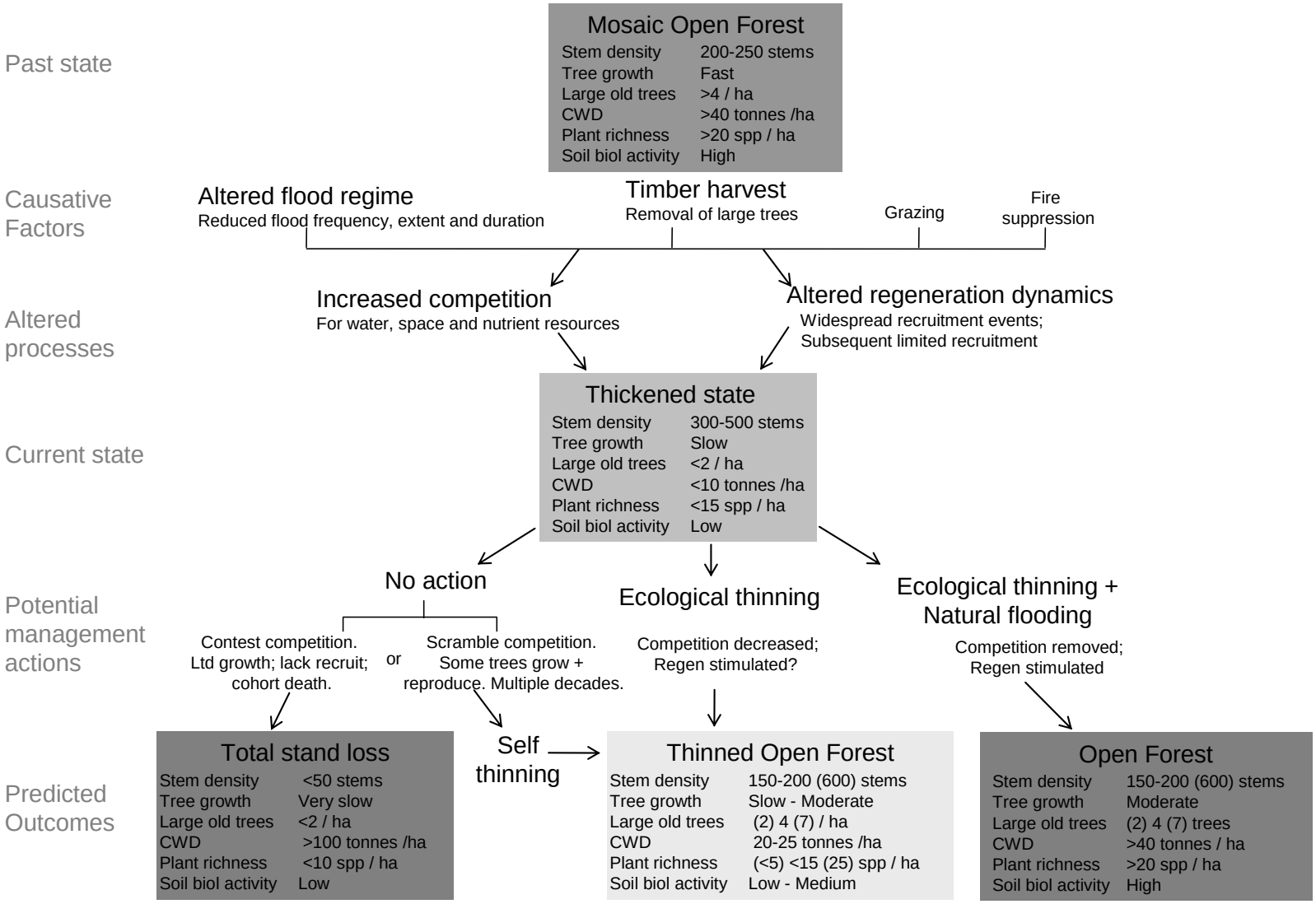
from one state to another under alternative management actions is estimated. The model will allow for modeling scenarios in which alternative management actions are simulated, including simulations to predicting the effects of ecological thinning.

Based on the initial outcomes of an elicitation workshop (Walshe et al. 2011), a simplified process model has been developed to document the primary ecological processes relevant to high density stands of River Red Gum forest exhibiting canopy dieback (Figure 1.7). The process model includes detail of the degree to which some key site features may change under different management scenarios over a 60 year time frame. In summary, the process model (Figure 1.7) contends that:

- **Past state**: Prior to European settlement, River Red Gum forest is likely to have existed as a Mosaic Open Forest. The vegetation in this state would have been characterised by large, well spaced trees interspersed by mixed aged stands of River Red Gums, including small areas or strips of thicket vegetation. In the absence of anthropogenic disturbance, the occurrence of a recruitment event in Mosaic Open Forest (e.g. after a flood has receded, or after a fire) would have resulted in patchy establishment of seedlings and saplings due to: a) strong competition from large old trees; and/or b) a flood, fire or drought in the subsequent season or year causing seedling death. It is postulated that these two mechanisms would have prevented wide scale recruitment of even-aged stands of River Red Gums.
- **Causative factors**: Two main factors are believed to have altered ecological processes in River Red Gum forests: altered flood regimes and timber harvesting. To a lesser extent grazing and fire suppression also acted to alter ecological processes.
- **Altered processes**: The process model postulates that the combination of the above four causative factors resulted in the alteration of two key processes in River Red Gum forests.
    - The first, and arguably most important, is increased competition for water resources. To a lesser extent, competition for space, light and nutrient resources is also likely to have increased. *Eucalyptus camaldulensis* is known to have particularly high water requirements (Dalton 1990, cited in ANBG 2011). Reduced flood frequency, extent and duration has reduced the total amount of water available to trees (as well as understorey species). Competition for water is evidenced by a reported decrease in growth rates by up to 40% in River Red Gums in Barmah Forest and on Gunbower Island over the long dry period after 1996 (Mac Nally et al. 2011), and also the extensive canopy dieback (Cunningham et al. 2009a, 2011) that indicates leaf shedding has occurred.
    - The alteration of regeneration dynamics has also contributed to the development of thickened stands from Mosaic Open Forest. Harvest of large trees created substantial gaps in which widespread recruitment could occur in the absence of competitive dominance from large trees. Increased inter-flood time intervals, as well as reduced extent and duration of floods, reduced the likelihood that seedlings would be drowned out by subsequent floods. Thus, widespread stands of even-aged cohorts of *Eucalyptus camaldulensis* established. Further recruitment is inhibited by the extant trees, which form a near continuous zone of influence over resources.
- **Current state**: As a consequence of reduced water availability, and widespread recruitment events followed by limited recruitment, current thickened stands exist in a state of considerable competition amongst even-aged trees. It is considered likely that competition for relatively scarce water resources that is maintaining slow tree growth rates
- **Potential management actions**: **No action**. It is postulated that in the absence of active management, there is considerable uncertainty about the pathway that a stand may take, and two main alternatives are considered plausible:

- **Stand loss**: Stand loss may arise if most, or all, individuals in a population fail to obtain sufficient resource to survive and reproduce. This is known as scramble competition (Nicholson 1954). Lack of recruitment events may result in insufficient new individuals to sustain the population. In concert, scramble competition and lack of recruitment confer a risk that older trees will senesce and die without replacement, and result in complete stand loss (Mac Nally et al. 2011). The resulting vegetation would be very open in structure, possibly forming an open woodland or shrubland. In the intermediate term, coarse woody debris levels would increase substantially due to the collapse of dead trees.
- **Self thinning**: Thickened stands may self-thin, in which only some individuals in the population obtain sufficient resource to survive and reproduce, and the remainder die. This is known as the contest model of competition (Nicholson 1954). Assuming that flood regimes are managed using environmental flows as per recent years, slow growth rates are likely to be maintained and therefore such a process may take multiple decades. It may take in excess of 100 years for hollow bearing trees to form.

- **Potential management actions: ecological thinning**. It is contended that if ecological thinning is applied to the current thicket state, the decreased number of individuals in the *Eucalyptus camaldulensis* population will reduce competition for water (and to a lesser extent light, space and nutrient resources), facilitating faster growth rates in retained trees. Consequently, large trees may develop within a few decades (40-60 years). It is possible that the increased availability of light may also stimulate increased diversity of understorey plant species. This scenario assumes that current environmental flows are maintained, with minimum flows dependent (to some extent) on annual rainfall, delivery of water restricted by infrastructure, and continued demand for agricultural water delivery.
- **Potential management actions: ecological thinning + natural flood regime**. It is postulated that transition from the current thickened state to a Mosaic Open Forest state would not be possible without a reinstatement of the natural flooding regime - as environmental flows in a drying climate will never replicate a natural flow regime. It is considered likely that a wetter climate than is predicted would also be required to facilitate this transition. However, if ecological thinning were applied current thickened state in concert with an environmental flow regime that approximated a natural flooding regime to the greatest extent possible within a drying climate, then the resulting vegetation would approximate a Mosaic Open Forest. Tree growth rates would remain slower, recruitment dynamics may still be altered and understorey species diversity may be limited. This scenario assumes that minimum environmental flows would be dependent on annual rainfall, but not as restricted by infrastructure or demand for agricultural water delivery. The extent, duration, frequency and timing (seasonality) of environmental flows would intend to mimic a natural flow regime to the best available knowledge.



Notes: Large trees: >1m dbh. For some variables in some states, upper and lower bounds have been provided in addition to best estimates, indicated by parentheses.

Figure 1.7. Simple process model for thickened stands of River Red Gum forests.

1.8. Management actions to trial

The key gaps in knowledge regarding how to manage River Red Gum forests, include:

a) Promote a diversity of habitats in the landscape for indigenous species, including key habitat features such as hollow bearing trees and coarse woody debris;

b) Prevent further decline in canopy condition (the proportion of canopy that is dead); and

b) Minimise the risk of mass tree death.

It is not known how best to manage dense stands of River Red Gums in order to address these three issues of conservation concern. In the context of future climate change, and reliance on environmental flows, it is also not known whether management actions should differ amongst sites of differing levels of water availability. Both stem density and canopy dieback are amenable to management. In an adaptive management framework, management actions selected to trial must be: a) identified in the process model as being a possible path to cause transition between two states; b) plausible in terms of time and budgetary constraints; c) unlikely to cause any long term adverse impacts on the features of conservation concern. Ecological thinning, discussed in detail below, meets these criteria.

1.8.1. Ecological thinning

Ecological thinning is the selective removal of stems to achieve conservation goals, such as restoring ecosystem structures or processes (Dwyer et al. 2010). Ecological thinning aims to mimic the natural process of self-thinning (contest competition, Nicholson 1954) driven by intraspecific competition for resources, but over a shorter time-frame. Silvicultural thinning involves reducing stem density to increase growth of selected trees into a commercial timber resource (Di Stefano 2001). Silvicultural thinning is often termed ‘thinning from below’, and aims to retain dominant and co-dominant trees of the same age class at a spacing such that their crowns have just enough room to grow together again by the time of the next harvesting operation, 25 to 30 years (FCNSW 1984).

Alleviating competition for resources is the mechanism by which both ecological and silvicultural thinning seek to modify the growth of retained trees (Deal 2007; Allen et al. 2002; Davis et al. 2007). Generally speaking, silvicultural thinning seeks to promote straight trees, whereas ecological thinning seeks to promote trees with a spreading form where hollow development is the goal. Therefore ecological and silvicultural thinning may require different thinning protocols, including different tree retention criteria, spatial arrangement of retained trees, thinning intensity and method of tree removal. Ecological thinning should reduce competition for resources and thereby reduce the occurrence of canopy dieback and promote growth rates of retained trees, and potentially promote the development of large and hollow bearing trees. It is considered an appropriate management action to trial to address the conservation concerns in River Red Gum forests.

Review of silvicultural thinning

Silvicultural thinning is usually implemented as a reduction in basal area (e.g. Zagas et al. 2004; Kariuki 2008). Spacings between retained trees are also used (e.g. FCNSW 1984; Schonau and Coetzee 1989), and numerous studies are published documenting growth rates and tree form in plantings with different row spacings (e.g. Bernardo et al. 1998).

Clumping of retained trees is considered to reduce the zone of influence of retained trees, that is the total area over which a tree obtains and competes for resources, and impedes recruitment and growth (Incoll 1979; Rotheram 1983; Bi and Jurskis 1997, cited in Basset and White 2001; FCNSW 1984). The effects of silvicultural thinning described in published research is summarised in Table 1.6.

Table 1.6. Summary of reported effects of silvicultural thinning.

Feature	Effect of thinning	Species	Reference
Overall stand productivity (total stand volume)	Decrease	mixed Eucalypts	Schonau and Coetzee (1989)
Overall stand productivity (total stand volume)	Decrease	mixed Eucalypts	Kariuki (2008)
Overall stand productivity (total stand volume)	Decrease	Holm Oak *Quercus ilex*	Zagas et al. (2004)
Absolute and relative growth rates of individual trees	Increase	mixed Eucalypts	Schonau and Coetzee (1989)
Mean annual diameter growth	Increase with thinning intensity.	mixed Eucalypts	Kariuki (2008)
Mean annual diameter growth	Higher in smaller trees compared to larger trees, (after one to two years of no growth or shrinkage).	mixed Eucalypts	Kariuki (2008)
Duration of thinning response	Increase with thinning intensity, and still evident 29 years after thinning.	mixed Eucalypts	Kariuki (2008)
Vitality (undefined term)	Improve	Holm Oak *Quercus ilex*	Zagas et al. (2004)
'Stem quality' (undefined term)	Improve	Holm Oak *Quercus ilex*	Zagas et al. (2004)
'Best form', which is best achieved in a dense stand	Compromise	mixed Eucalypts	Schonau and Coetzee (1989)
Understorey cover	Decrease initially, but recovery within 3 years.	Douglas Fir *Pseudotsuga menzeisii*	Thysell and Carey (2001)
Importance of native and exotic species	Increase importance of native species (variable density thinning).	Douglas Fir *Pseudotsuga menzeisii*	Thysell and Carey (2001)
Understorey floristics (abundance or species composition)	No detectable change (thinning by injecting, four to five years after treatment).	*Eucalyptus obliqua* in wet sclerophyll forests	Nayland and LaScala (2005)

Review of silvicultural thinning in River Red Gum forests

Thinning trials in River Red Gum forests for silvicultural purposes were conducted between the 1950s and the 1980s (FCNSW 1984). Thinning implemented in Murrumbidgee forests using spacings based on the diameter of the selected stem in inches plus 6 (i.e. a 10 inch

(25cm) stem would be spaced roughly 16ft (4.9m) from its neighbours) (FCNSW 1984). Schonau and Coetzee (1989) recommended that rows be not wider than 3 m. A series of thinning plots were established in 50 year old regrowth with a mean height of 22m and nearly 3000 stems per hectare, using a range of (unspecified) thinning treatments (FCNSW 1984). The plots were reviewed by Hamilton (1971, 1972, both cited in FCNSW 1984), who drew the following conclusions:

- At wider (about 7.3m) spacings, crop trees had maintained a dbh increment of about 0.7cm a year over 10 years.
- Where spacings of crop trees were not more or less regular, growth was lower than expected (one plot only).
- Coppice growth was observed to develop strongly in most plots. Coppice survived on 75% of stumps and appeared to have a retarding effect of growth of retained trees.

In River Red Gum forests Australian Group Selection and Single Tree Selection were recommended in stands of higher and lower Site Quality (i.e. water availability), respectively, to create sufficient canopy openings to allow effective regeneration (State Forests of NSW 2001). It was suggested that canopy openings equivalent to at least three mature crowns were required to allow effective regeneration, due to the strong suppressive effect of mature River Red Gum trees on seedling regeneration (FCNSW 1984).

Review of ecological thinning

Ecological thinning, sometimes called restoration thinning, has been advocated to facilitate the development of old-growth forest conditions that more closely resemble those that would occur under a natural disturbance regime (Tappeiner et al. 1997; Archibald et al. 2010). The use of thinning in forest restoration has been most widely applied and documented in Ponderosa Pine, Douglas Fir and other softwood ecosystems across the northern hemisphere (e.g. Simard and Hannam 2000; Covington et al. 2001; Allen et al. 2002).

Three thinning treatments were applied to dense planted stands of *Psedotsuga menzeisii* to promote late successional forest structures (Davis et al. 2007). Initial stem densities were up to 900 stems per hectare, and residual densities from Light and Heavy thinning treatments were 250-300 and 125 stems per hectare respectively. A Light thin with Gaps treatment was also implemented with additional evenly dispersed 0.2 hectare patch cuts. The main observed responses, a maximum of 5-7 years post-treatment, were (Davis et al. 2007):

- Average diameter growth of Douglas-fir increased in all thinned stands, but growth of the largest Douglas-fir trees was only accelerated in the Heavy Thin treatment.
- The absolute growth rate of the 10 very largest trees per hectare was not significantly different between treatments. This may suggest that in some instances even more intensive thinnings may be desirable to accelerate growth of the largest trees. In these cases variable density thinnings may be appropriate to minimse risk of wind damage.
- After thinning, the canopy of all thinned treatments was initially more open than the Control, but after 5-7 years the Light Thin was no longer significantly different from the Control.
- The Light with Gaps treatment had the highest variation in overstory canopy cover.
- For trees > 5 cm dbh and small trees, mortality of Douglas-fir and combined hardwoods was higher in the Control than all other treatments.

In Australia, ecological thinning has been trialled in dense stands of White Cypress Pine (*Callitris glaucophylla*) in NSW (McHenry et al. 2006), and in dense stands of Brigalow

(*Acacia harpophylla*) in southern QLD (Dwyer et al. 2010). The goal of ecological thinning in *Callitris glaucophylla* was to determine wether thinning could ameliorate the perceived land degradation caused by its dense regrowth; for *Acacia harpophylla* it was to develop structure and biomass comparable with a minimum acceptable reference ecosystem in the fastest possible time. *Callitris glaucophylla* stands were surveyed 4-5 years post-thinning, and *Acacia harpophylla* 2 years post-thinning. Both studies reported: increased biomass of the remaining individual trees; increased growth rates of retained stems relative to controls; and increased native groundcover (McHenry et al. 2006; Dwyer et al. 2010). Another small-scale study undertaken in *Callitris glaucophylla* indicated that the initial increase in tree growth in response to thinning diminished rapidly two years after the thinning treatment due to prolific regeneration both of *Callitris glaucophylla* and other species in the understorey (Johnston 1979, cited in McHenry et al. 2006).

In relation to effects of thinning on understorey, thinning in *Acacia harpophylla* also increased native woody species diversity (Dwyer et al. 2010), but differences in plant diversity in *Callitris glaucophylla* were explained by other site factors (McHenry et al. 2006). Further, thinning in *Eucalyptus grandis* plantations with dense exotic understorey vegetation stimulated regeneration of native species and richness or abundance of native woody shrubs, understorey trees and native perennial herbs (Cummings and Reid 2008).

Ecological thinning to improve habitat values has been trialled in the Box Ironbark Forests of Victoria (Pigott et al. 2010). The results of the thinning trial have not yet been published, however, recommendations regarding logistical aspects include: • Specialised training/supervision for thinning staff; • Good understanding of tree densities and the number of trees to be felled to achieve thinning targets; • Plan for labour-intensive and time consuming timber removal; • Plan for site access and terrain issues; • Consider stem injection or mechanised tree-felling as an alternative to chain-saws.

1.8.2. Ecological thinning in River Red Gums

It is postulated that competition for water is the primary process currently contributing to high stem density, canopy dieback and slow growth rates preventing development of large old trees in River Red Gum forests (see Figure 1.7). Management actions that might address competition for water in River Red Gum forests can seek to either increase availability of water or reduce the number of individuals in competition. Competition for space, light and nutrients may be secondarily contributing to maintenance of high stem densities and canopy dieback.

In its investigation into River Red Gum Forests, VEAC (2008) made a number of recommendations, including: ‘Development of an adaptive management approach based on clearly defined, transparent and scientifically supported ecological objectives (e.g. ecological burning to promote certain fire-dependent ecosystems, ecological thinning and short-term grazing for ecological or management purposes such as targeted weed control)’.

The NRC (2009b) stated that ‘In certain areas, thinning can provide a potentially useful tool to reduce competition among trees and alleviate water stress. Hence, it could play an important role in enhancing survival of key forest attributes (such as old trees) in a drying forest’. The NRC (2009b) also specified five principles for ecological thinning.

NRC (2009b) Principles for Ecological Thinning

Principle ET1: Ecological thinning can provide a valuable tool to achieve specified conservation outcomes in some River Red Gum forests, including those managed primarily for production and for conservation.

Principle ET2: Ecological thinning can be undertaken in many different ways, with different impacts on forest structure, processes and biodiversity. Wherever thinning is undertaken to achieve conservation goals, these goals must be clearly specified, and the most appropriate technique must be used to ensure that goals can be met.

Principle ET3: Ecological thinning should be applied to forest areas where clearly defined outcomes can be reasonably expected.

Principle ET4: All ecological thinning should be implemented using an experimental, adaptive management framework to ensure desired outcomes are achieved, maximise learning outcomes and reduce uncertainty.

Principle ET5: Thinning, like all other management activities, should be carried out in accordance with accepted principles for landscape management of forested areas.

The effects of pre-commercial thinning on the development of habitat features in River Red Gum forests in Barmah was analysed by Horner et al. (2010), using a 42 year data set. This study produced some evidence that the selective removal of trees from stands of River Red Gum can reduce competition for water resources and promote growth rates of retained trees. Thinned stands were found to produce more hollow-bearing trees (Figure 1.8) and to increase the proportion of trees in larger size classes compared (Figure 1.9) with unthinned sites (Horner et al. 2010).

The results of Horner (2010) suggest that thinning stands to densities of 560 trees per hectare is likely to optimise growth of hollow-bearing trees, but they suggest that it would be prudent to establish a wider range of stand densities, with different thinning treatments monitored and evaluated as part of a landscape-scale experiment.

More information is required into the effects of alternative levels and methods of thinning, and the extent to which effects of thinning are dependent initial tree densities.

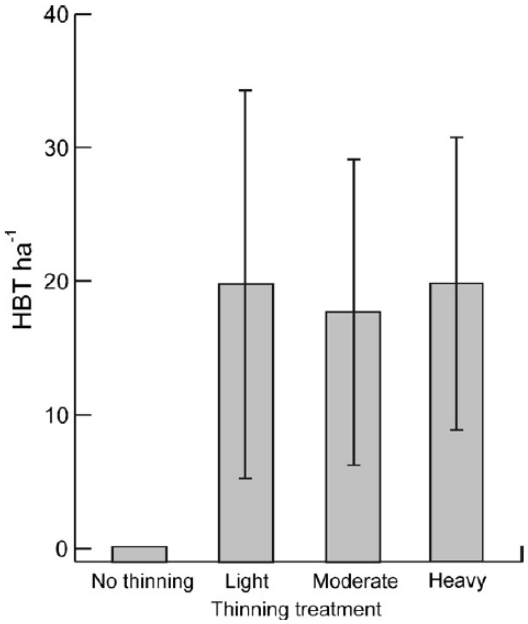


Figure 1.8. Effect of thinning intensity on abundance of hollow-bearing trees (HBTs). Treatments ónó thinningô, ólightô, ómoderateôand óheavyôcorrespond to post-thinning densities of 4000, 760, 560 and 270 trees per hectare, respectively. A hollow was defined as a cavity with a minimum entrance diameter and depth of approximately 5 cm, located > 2 m off the ground. Frequencies are treatment means; error bars are SEM. From Horner et al. (2010).

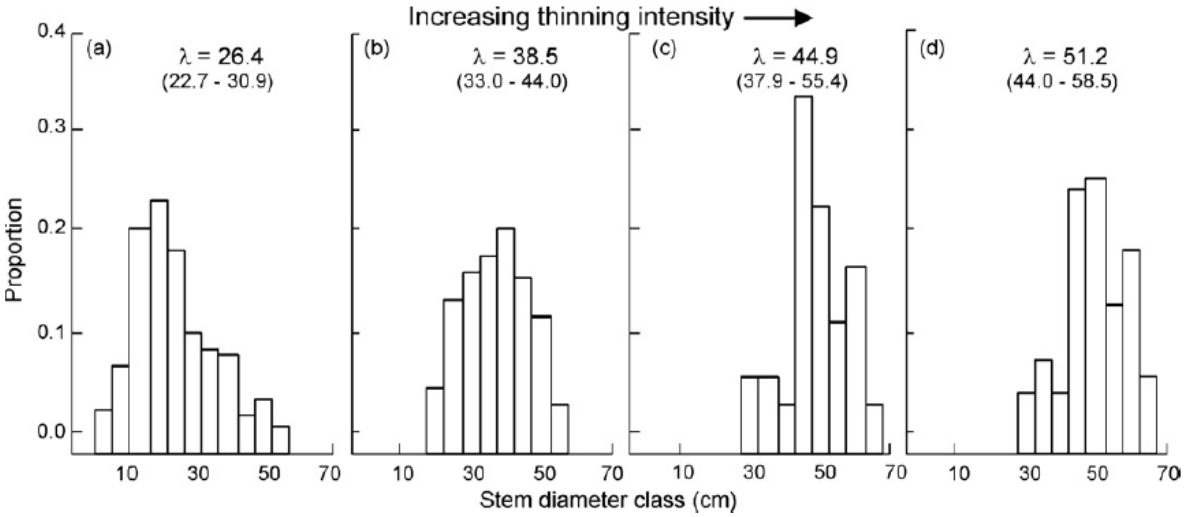


Figure 1.9. Stand size distributions in 2007 for stands with post-thinning densities of 4000 (a), 750 (b), 560 (c) and 270 trees per hectare (d). Proportions are treatment means. Estimates of Weibull scale are included in header with 95% credible intervals in parentheses. From Horner et al. (2010).

2. River Red Gum ECological thinning trial in NSW and Victoria

An ecological thinning trial will be conducted in River Red Gum forests in order to address the key gaps in knowledge identified above. Ecological thinning in River Red Gum may:

a) Promote a diversity of habitats in the landscape for indigenous species, including key habitat features such as hollow bearing trees and coarse woody debris;

b) Prevent further decline in canopy condition (the proportion of canopy that is dead); and

c) Minimise the risk of mass tree death.

The process model that underpins this trial proposes that competition for relatively scarce water (relative to historical flood regimes) is central to the maintenance of high density stands (see Figure 1.7). The process model proposes that removing some of the trees from thickened stands will reduce competition for water and other resources, allowing retained trees to survive longer, develop a spreading form and develop hollows more rapidly. It also proposes that thinning will affect changes to understorey features. The effect of thinning may depend on differing levels of water availability, as this is relevant to competition for water. To investigate these propositions, the management experiment will comprise:

- two blocking factors
  - initial tree density (three levels)
  - water availability (two levels)
- one treatment factor
  - post-treatment tree density (three levels)

The Barmah-Millewa River Red Gum forest reserves have been selected for implementation of an ecological thinning trial because they contain sufficient stands of high stem density forest in which to adequately replicate thinning treatments. Forests with severe canopy dieback are excluded from the trial, as it is postulated that these forests are predominantly associated with discontinued artificial flooding via infrastructure, and therefore require consideration of alternative management actions within the adaptive management framework.

2.1. Aims of ecological thinning trial

The aims of the ecological thinning trial are expressed as a hierarchy, which reflects the varying importance of different measurable effects of the treatments:

> The primary aim for the trial is to determine whether any of several levels of ecological thinning positively affect biodiversity, canopy condition and resilience to epidemic River Red Gum mortality within all stands of RRG forests, and whether these effects depend on water availability and initial stem density.
>
> The secondary aim for the trial is to determine whether any of several levels of ecological thinning positively affect characteristics of the stands that are reasonably expected to lead to the primary aim, and whether these effects depend on water availability and initial stem density. For example: hollow-bearing tree recruitment levels, and understory species diversity.

The tertiary aim for the trial is to determine whether any of several levels of ecological thinning positively affect characteristics of the trees that are reasonably expected to lead to the secondary aim, and whether these effects depend on water availability and initial stem density. For example: tree diameter growth rates, tree diameter distribution diversity, crown shape and health.

2.2. Hypotheses

A series of hypotheses were generated as to the potential effects of thinning, based on the process model. Hypotheses related to effects on individual tree features, tree population characteristics, forest structure and site features; to the flow-on effects to indigenous and non-indigenous flora and fauna; and to any processes or disturbances associated with implementing the treatments. The initial set of hypotheses was therefore wide-ranging and numerous. The monitoring program that would have been required to address each hypothesis was beyond the available budget and resource capacity. Therefore, hypotheses were prioritised, and limited to those that related directly to: the features of conservation concern; improving understanding of the processes acting to maintain high stem density stands of River Red Gum forest; or potential deleterious effects of thinning.

The following set of hypotheses document the predicted effects of ecological thinning. It is hypothesised that the effects will be greatest at sites with high initial stem densities, low post-treatment densities and high levels of water availability. Information concerning the rationale or conceptual process model underpinning each hypothesis, as well as any available published evidence supporting each hypothesis, is provided in Appendix A.

1. Effects on tree populations and forest structure

1.a. Increased survival and growth rates of retained trees
1.b. Increase the number and proportion of trees occurring in large diameter size classes
1.c. Increased spread and hollow development rates of retained trees
1.d. Increased tree canopy health (proportion of potential crown that is live) of retained trees
1.e. Increased recruitment of tree seedlings in early post-treatment years
1.f. Increased survival of seedlings (< 1.3m) and saplings (> 1.3m, <10cm dbh)
1.g. Increased structural diversity of mid- and under-storey strata
1.h. Higher levels of coarse woody debris (45-50 t/ha) maintained in long term
1.i. Increased heterogeneity in cover and depth of forest litter in the long term
1.j. Decreased persistence of stags in the short term
1.k. Increased fuel and fire risk

2. Effects on mammalian and avian diversity

2.a. Increased diversity of bat species, and increased levels of site utilisation by bat species
2.b. Increased abundance and frequency of foraging activity by woodland bird species
2.c. Increased abundance of gliders
2.d. Increased abundance of predators, in particular foxes

3. Effects on vascular plant diversity

3.a. Increased diversity and cover of exotic plant species in understorey in the short term, decreasing it in the long term

3.b. Increased diversity and abundance of native plant species

2.3. Blocking factors

The two blocking factors that underpin the experimental design, initial stem density and water availability, are relevant to water demand and water supply, respectively.

2.3.1. Initial stem density

Sites will be stratified across three stem density classes that have been mapped across Barmah and Millewa: <200; 200-399; >400 stems per hectare. As the issues of conservation concern (Figure 1.3) are greatest in the highest stem density class (>400 stems per hectare), a majority of sites will be located in these stands. In order to gain some information about the effects of thinning in lower density stands, a smaller proportion of sites will be located in lower density stands (<400 stems per hectare). A minimum of two sites are required in order to ensure sufficient statistical power to detect effects in any given density class (Robinson 2011). That is, there will be unequal replication of sites across the stem density classes (see Section 2.6 below): almost 50% of effort will be allocated to stands with >400 stems per hectare; 36% of effort to stands with 200-400 stems per hectare and the remaining 18% of effort to stands with <200 stems per hectare.

2.3.2. Water availability

Water availability will be defined as two levels, and sites will be equally replicated across the two levels of water availability in order to test the hypothesis that the effects of ecological thinning are greater on sites with greater water availability. As discussed in Section 1.6 above, water availability is a function of both inundation from flooding and ground water depth. Site Quality will be used as a surrogate for water availability, with sites equally replicated in Site Quality 1 and Site Quality 2.

2.3.3. A note on canopy condition

Within the Barmah-Millewa forests, declining canopy condition (increased proportion of the total potential canopy that is dead) is likely to be a symptom of competition for relatively scarce water resources. It has not been selected as a blocking factor in the experimental design because it is known to respond in very short time frames to changes in water supply. In response to the late summer 2012 flood event, it is likely that the present on-ground canopy condition will differ from the mapped canopy condition classes (mapped from 2009 aerial photography, Bowen et al. 2012), as some trees will have died and others will have recovered to varying degrees since the date of imagery. However, 2009 canopy condition may be an informative co-variable in the analysis of forest response. Therefore, site locations will be randomised across three mapped canopy condition classes (0-10%, 10-40%, 40-80%), to sample the range of variation from 0-80% dead canopy. Sites with >80% dead canopy will be excluded from this trial, as alternative management actions will be proposed in future phases of adaptive management of these stands.

2.4. Treatment details

Two thinning treatments and a no-thinning control will be implemented, based on spacings of retained trees: moderate thinning with 7m spacings; and heavy thinning with 15m spacings.

Table 2.3. Ecological thinning treatment levels

Treatment level	Maximum post-treatment spacing	Final density	Retained basal area*	Habitat trees
Heavy thinning	15m	Approximately 60 stems/ha	Approx. 8 – 12 m2/ha*	Retain all suitable habitat trees and potential habitat trees (> 40 cm DBH), even if it results in clumping of retained trees
Moderate thinning	7m	Approximately 260 stems/ha	Approx. 16 – 20 m2/ha*	Retain all suitable habitat trees and potential habitat trees (> 40 cm DBH), even if it results in clumping of retained trees
Control	Variable	<200 stems/ha to >400 stems/ha	Variable	Retain all suitable habitat trees and potential habitat trees (> 40 cm DBH), even if it results in clumping of retained trees

*Basal area will not be used to implement treatments, these values are estimates of the basal area likely to be retained given the implementation of spacings.

The Moderate Thinning treatment is equivalent to the widest spacings likely to be implemented in commercial silviculture (7.3m, FCNSW 1984), and substantially wider than most silvicultural thinning treatments (3-4m, Schonau and Coetzee 1989). The Heavy Thinning treatment spacings are based on crown diameters of large *E. camaldulensis* trees, in order to facilitate spreading crowns and development of branches that may lead to hollow development. Large trees (>80cm dbh) in low density stands of River Red Gum forest are known to have crown diameters of approximately 17m (NPWS unpublished data); and FC NSW (1984) report crown diameters of 18m for trees with 150cm dbh.

Tree retention: The Operational Plan will detail tree selection methods and measures for minimising observer error. Prior to treatment, all trees with visible hollows, all dead trees with dbh >20cm, and all trees with dbhob (dbh over bark) >40cm will be marked for retention. In exceptional circumstances, where it is not possible to implement the treatment specifications in low (<200) density stands, few trees between 40 and 50cm dbh may be removed (see spacing method below). For safety reasons, some dead trees may need to be felled and some dead trees may fall when struck by a felled tree. However these circumstances will be limited, as standing dead trees will be retained wherever possible, leaving a buffer if necessary.

Spacing method: From one retained tree, a spacing of 7 or 15m will be measured out, and another tree selected for retention, and so on. Smaller trees will be preferentially removed. Clumping of large retained trees will be allowed such that the mean spacing within the plot conforms to the specified treatment levels. Retention of trees in clumps will replicate the natural heterogeneous distribution of trees in River Red Gum forests. In exceptional

circumstances where post-treatment spacings still cannot be achieved, a very limited number of trees up to 50cm dbh may be removed. Details will be in the Operational Plan.

Felling method: Trees not marked for retention will be machine felled. Each stump will be painted with Glyphosate biactive within 5 minutes to restrict coppicing. The felling method will aim to minimise damage to retained trees. The exact felling method will be dependent on the tender process, and will be documented in the Operational Plan.

Marking: Each treatment site will be marked by OEH & PV staff prior to any felling of trees. Retained trees, exclusion zones and the plot boundaries will be marked. Marking methodology will be included the Operational Plan.

Timing of treatments: It is expected that all thinning treatments will be conducted before the end of June 2013. The exact timing of treatments will depend on recession of the flood waters.

Coarse woody debris: Felled trees will be retained on site within a range of 45-50 tonnes per hectare. CWD levels will be measured post thinning and felled trees will be randomly removed from the plot until the 45-50 tonnes per hectare level is reached. Felled trees will not be stacked up against retained trees. Felled trees that increase the level of CWD to more than 50 tonnes per hectare will be removed from the treatment plots, but all CWD that was present pre-treatment will be retained. Mac Nally et al. (2001) found that restoration targets for CWD in River Red Gum forests may reasonably be set at 40-50 tonnes per hectare, and that bird species diversity and abundance would be aided by the imposition of a high variance in CWD load densities rather than an even distribution. The NSW BioMetric benchmark for CWD in River Red Gum forests is 45 tonnes per hectare, where the benchmark represents a stand of a comparable natural ecosystem exhibiting relatively little evidence of modification since post-European settlement (DECC 2008).

2.5. Randomised block design

The principle of blocking in experimental design aims to group experimental units together into blocks, and then randomly apply each level of the treatment factor(s) to experimental units in each block (Figure 2.1) (Quinn and Keough 2002). The benefit of using a randomised block design is that it minimises the contribution of patchiness in the background environment to variation in the response variables. By grouping the experimental units into blocks that have similar background conditions, some of the total variation in the response variables will be explained by differences between the blocks. This reduces the residual unexplained variation and permits more powerful tests of treatments.

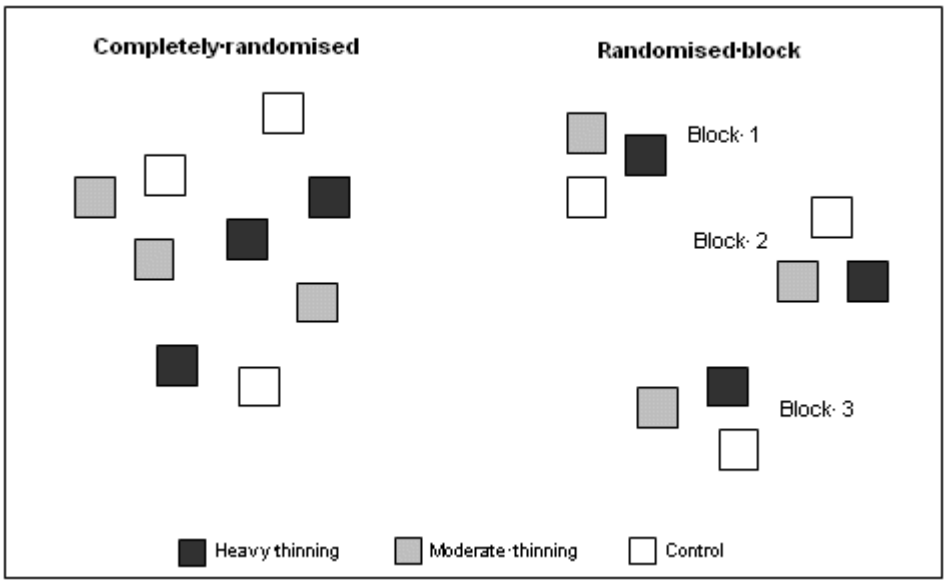


Figure 2.1. Spatial layout of an experiment with three treatments (2 levels of thinning treatment and a control), contrasting a completely randomised design and a randomised block design (adapted from Quinn and Keough 2002).

A randomised block design with unequal replication will be employed. Sites will be selected in clusters of three plots, and randomly allocated to Heavy Thinning Treatment, Moderate Thinning Treatment or Control.

2.6. Replication, site and plot details

Replication: The trial will consist of approximately 22 sites located across NSW and Vic (Figure 2.2), as recommended by Robinson (2011). Each site will consist of a cluster of 3 plots: 1 x heavy thinning treatment plot, 1 x moderate thinning treatment plot, and 1 x control plot. In other words, there will be a total of 44 treatment plots. Stratification of sites across blocking factors in NSW and Vic is provided in Table 2.1. Thinning treatments will be applied in approximately 400 hectares of River Red Gum forest across Barmah and Millewa National Parks.

Table 2.1. Replication of sites across blocking factors.

Sites	Site Quality 1 <200 stems	Site Quality 1 200-400 stems	Site Quality 1 >400 stems	Site Quality 2 <200 stems	Site Quality 2 200-400 stems	Site Quality 2 >400 stems	Total
Millewa (NSW)	1	2	3	1	2	3	**12**
Barmah (Vic)	1	2	2	1	2	2	**10**
Total	**2**	**4**	**5**	**2**	**4**	**5**	**22**

Plot size: Each treatment and control plot will be 9 hectare in size. The size of the plot is considered sufficient to: exclude edge effects from surrounding forest; and detect responses in all of the vegetation, flora and fauna parameters of interest.

Plot shape: Plots will be square in shape (300m x 300m) where possible. However, shape of plots will be dependant on topography, and may be a different shape as determined by site characteristics.

Initial conditions: Within each site, all 3 plots will have the same mapped initial tree density (stem density) and water availability level prior to treatment. All plots have mapped canopy condition >80% live canopy.

Plot location: All treatment and control plots will be located a minimum of 100 metres and a maximum of 300 metres apart (where possible).

Plot alignment: Plots within a site will be aligned to ensure consistent average micro relief.

Plot Marking: The corners of plots will be permanently marked with steel stakes.

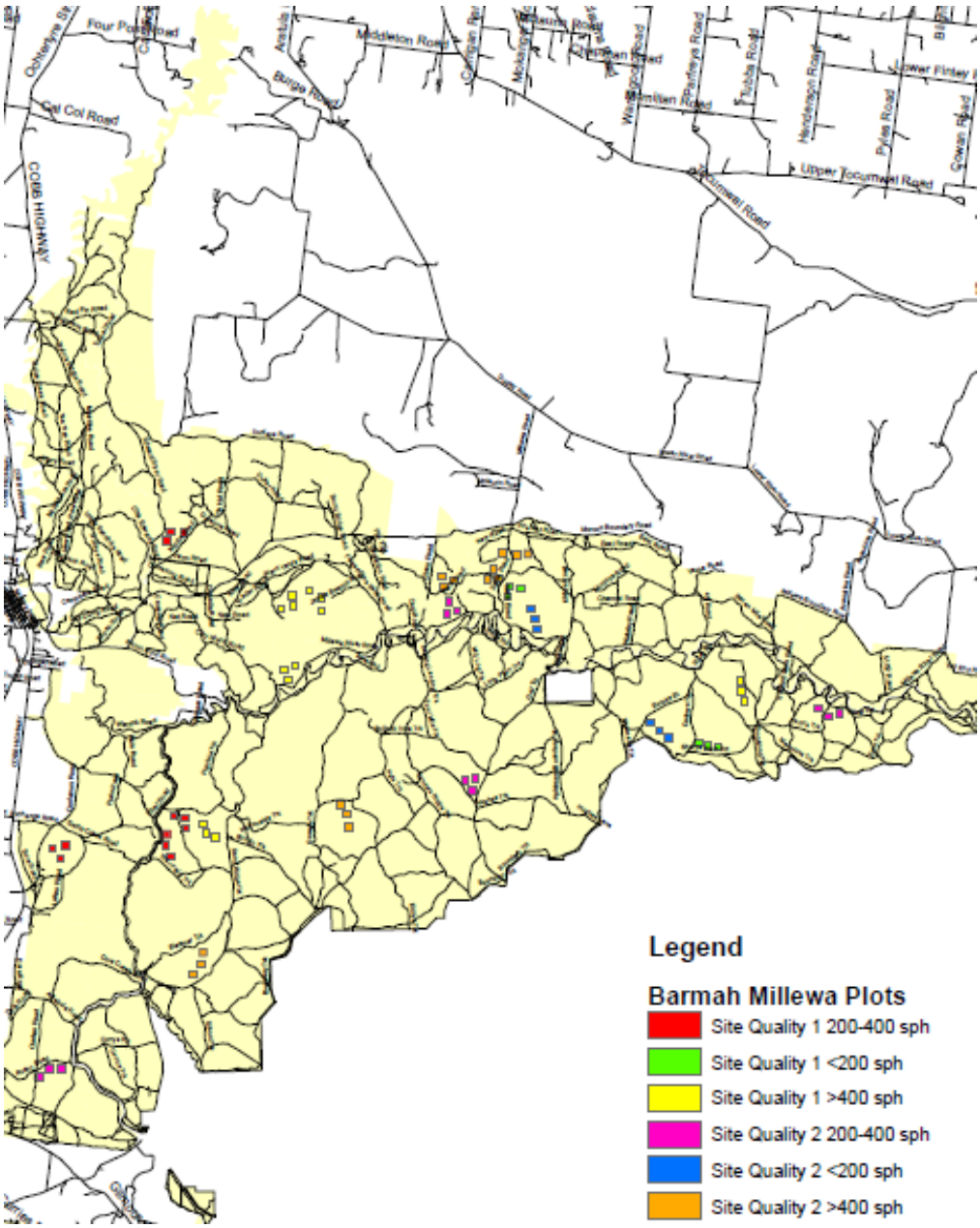


Figure 2.2. Proposed plot locations for ecological thinning trial, prior to threatened species and cultural heritage surveys

2.7. Exclusion factors for site selection

All sites will be located in stands that have not been affected by fire since 2001, and have not been harvested for sawlogs since at least 2001. All sites will be located in areas identified as River Red Gum forest in NSW and Victorian vegetation maps. Sites will be located >100 m from the nearest road (to minimise disturbance effects), but near fire trails (to minimise the need for ancillary access trail construction).

2.7.1. Recent fire

Fire plays an important role in the recruitment of River Red Gums, and the dynamics of River Red Gum forests. As there may be interactions between fire and thinning, all sites in this trial will have similar recent fire histories. All sites will be located outside areas that have been affected by fire since 2001 (Figure 2.3). Sites will also be located outside areas planned for fuel reduction burns in the near future.

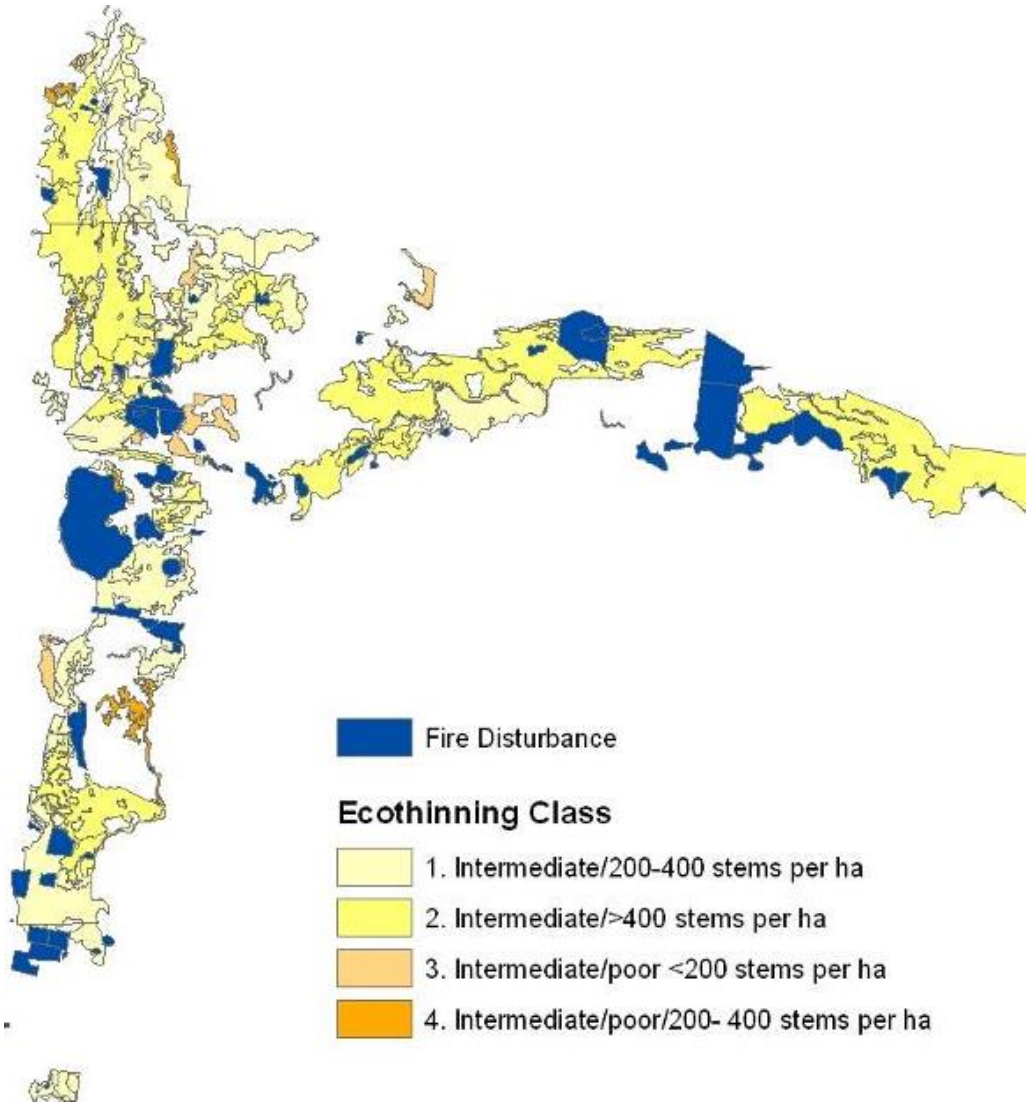


Figure 2.3. Areas in Millewa that have been affected by fire since 2001. Scale 1: 200 000. In Vic two small fires have been recorded since 2001.

2.7.2. Recent logging history

All sites will be located in areas that were last harvested for sawlogs at least ten years ago (i.e. prior to 2001) (Figure 2.4).

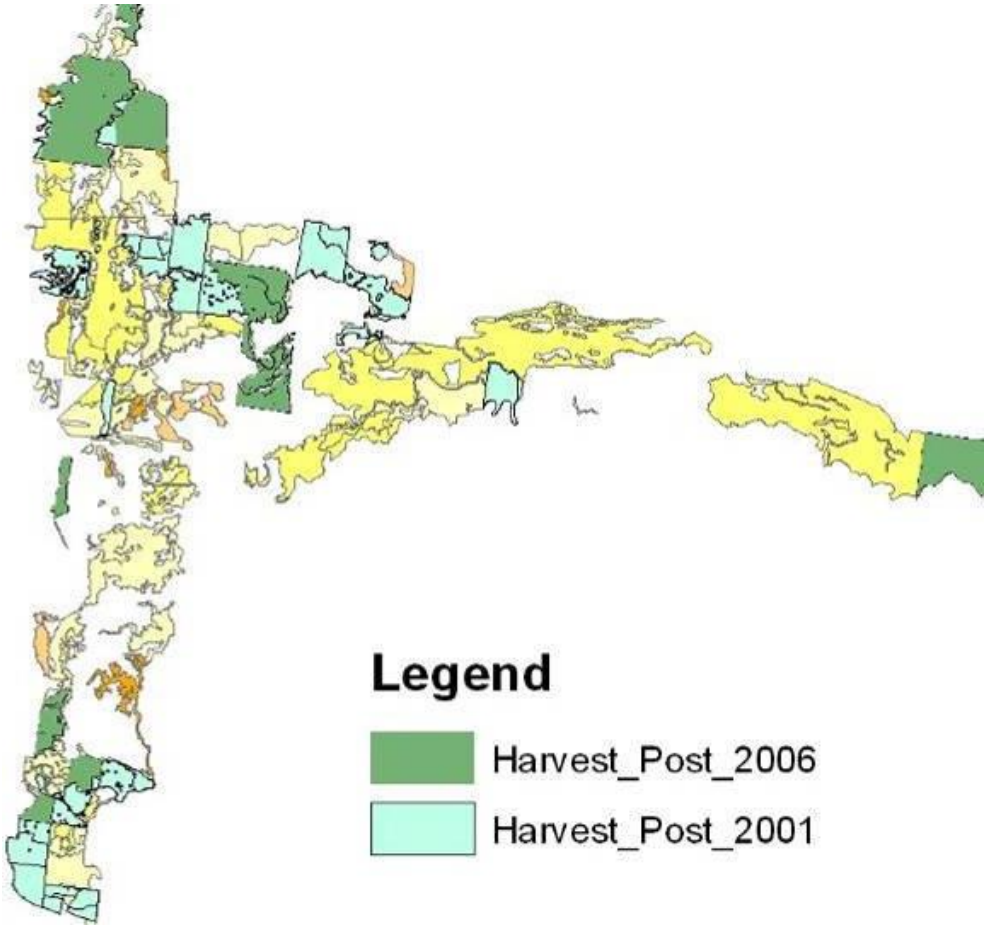


Figure 2.4a. Millewa River Red Gum compartment harvesting history.

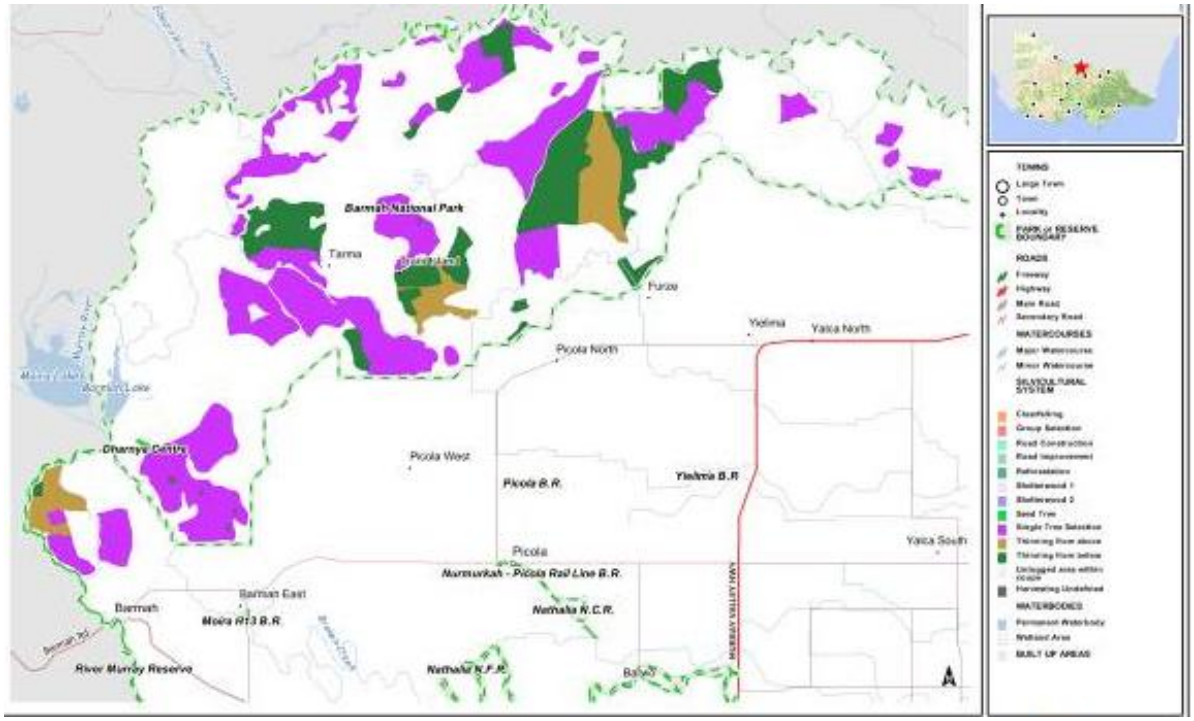


Figure 2.4b. Barmah River Red Gum silviculture history 2003-09.

2.7.3. Threatened species and key habitat features

In addition to desktop surveys of known location of threatened species, targeted surveys for threatened species and key habitat features will be conducted prior to final site selection (Table 2.2). A Review of Environmental Factors has been submitted to the Office of Environment and Heritage in NSW, and an referral under the Environment Protection and Biodiversity Conservation Act 1999 has been submitted to the Department of Sustainability, Environment, Water, Populations and Communities covering both NSW and Victoria. In accordance with REF and EPBC referral, where individuals or key habitat features of certain threatened species are detected within a treatment plot, an alternative location for the plot will be sought if ameliorative measures (such as buffers) are not appropriate.

Table 2.2. Pre-thinning threatened species and key habitat feature surveys.

Survey type	Features that will be included in survey
Key habitat feature surveys	Specific habitat features surveyed will include (but are not limited to): Potential bat tree roosts; Evidence of koalas; Superb Parrot nest trees; Hollow-bearing trees; Glider sap feed trees; Trees containing raptor nests or colonial waterbird nests. By their nature, the occurrence of threatened species in any given site is difficult to detect with accuracy. The general threatened species survey aims to detect presence of habitat features that are known to be indicative of potential or occupied habitat for threatened fauna.
General threatened species surveys	A general threatened species survey will also aim to record sightings of (non-nocturnal, non-canopy dwelling) threatened flora or fauna species.
Targeted nocturnal bird surveys	Presence; abundance; species richness of nocturnal birds. Nocturnal birds surveys will be conducted in order to detect the presence of threatened nocturnal bird species.

Survey type	Features that will be included in survey
Targeted arboreal mammal surveys	Presence; abundance; species richness of arboreal mammals. Arboreal mammal surveys will be conducted in order to detect the presence of threatened nocturnal mammals.

2.7.4. Heritage features

Prior to treatment, on-ground assessments will be conducted in NSW by OEH (Country and Cultural Heritage Division), Cummeragunja Local Aboriginal Lands Council and Yorta Yorta Aboriginal Nation Corporation, and in Victoria by Parks Victoria and Yorta Yorta Aboriginal Nation Corporation. Measures will be taken to avoid any sites of cultural heritage located within plots, including appropriate buffers or site relocation where necessary.

2.8. Experimental design summary

Management treatments	Levels	Implementation	Justification
Tree spacing	2 levels	Moderate (7m) / Heavy (15m)	7m spacings are on the lower end of spacings that would allow development of spreading trees (allowing an average crown of 15m diameter). The heavy thinning treatment allows for large trees (>50cm dbh) to be retained, while creating wider spacings for development of spreading trees (allowing an average crown of 15m diameter).
Thinning timing	1 level	Prior to end June 2013	All treatments will be implemented in 2012-2013, therefore interpretation of results will be specific to the climatic conditions of this period.
Felling method	1 method	Mechanical felling	A machine felling method will be used in preference to hand felling (see Pigott et al. 2010), as it is more time efficient.
Post felling treatment	1 treatment	Cut and poison	Cut stumps of removed trees will be painted with glyphosate biactive in order to prevent coppicing.
Clumping of unculled trees	1 level	Clumped	Retained trees will be clumped (heterogeneously distributed) rather than evenly spaced, to reflect natural occurrence patterns.
Coarse woody debris retention	1 level	45-50 tonnes per ha	The retention of CWD is consistent with the recommendations of VEAC (2008), NRC (2009a) and Mac Nally et al. (2002).

Stratification factors	Levels	Implementation	Justification
River Red Gum type	1 types	Forest	Future phases of adaptive management will address management of other River Red Gum ecosystems including woodlands and wetlands.
Initial density	3 levels	<200 stems/ha 200-399 stems/ha >400 stems/ha	The density classes were derived from mapping of stem density in Barmah and Millewa (Bowen et al. 2012).

Stratification factors	Levels	Implementation	Justification
Water availability	2 levels	Mod (Site Quality 1) Low (Site Quality 2)	These two levels of water availability
Initial canopy condition	Random	0-80% dead canopy	Randomly located across all mapped canopy condition classes, because of the variable nature of canopy condition.
Time since last fire	1 level	≥10 years since last fire	The trial aims to minimise any interactions between recent fire history and thinning treatment on the results.
Time since last harvest (stand age)	1 level	≥10 years since last harvest	The trial aims to minimise any interactions between recent harvesting history and thinning treatment on the results.

2.9. Licensing

Approval via Review of Environmental Factors has been granted for removal of trees in a National Park in NSW. In Victoria, removal of trees as part of a management activity (or scientific program) does not require approval, however the establishment of large projects is usually communicated to relevant DSE and PV managers.

3. Monitoring

Monitoring will occur under NSW scientific licence number (SL 100124) and NSW animal care and ethics licence number (AEC 090316/01). In Victoria a research permit is required from DSE to undertake scientific monitoring on public land. The approval process includes comment by PV where activities occur in parks and reserves and will be commenced when details of the project are finalised.

In order to increase the likelihood of detecting the effect of ecological thinning on site features, and to isolate the effect of thinning from other possible factors or processes, it is necessary to measure each variable at an appropriate spatial and temporal scale. Survey of variables (site features) prior to thinning is necessary for characterisation of heterogeneity due to environmental factors. Surveying them again at multiple time intervals post-thinning will enable the effects of the thinning treatments to be distinguished from any other causes.

3.1. Before After Control Impact

A Before After Control Impact (BACI) sampling design will be employed, based on the protocol of Green (1979) in which a sample is taken prior to impact as well as post-impact, in an impacted (disturbed) location as well as an undisturbed control location. The rationale for this design is that a disturbance that affects a site feature will appear as a statistical interaction between: the difference in mean values in control and impacted locations prior to the disturbance, and the difference in means after the disturbance.

Researchers have highlighted the importance of both spatial and temporal replication in BACI designs (Stewart-Oaten et al. 1986; Underwood 1994) in order to account for factors other than the disturbance of interest that may affect the differences between impact and control locations. Spatial variation in environmental parameters must be sampled at an appropriate scale to minimise the possibility that impact and control sites are inherently different prior to disturbance. Large temporal variance is not uncommon in many environmental parameters, and so it is important to establish the nature of differences between impact and control sites over multiple time periods. The monitoring planned for the ecological thinning trial involves sampling each site feature (response variable) at an appropriate spatial scale, and all sites will be surveyed at multiple time periods. The relatively large number of control plots in this trial is also appropriate for statistically detecting the effects of thinning.

3.2. Response variables

Measurable on-ground variables have been selected for monitoring on the basis that they are relevant to one or more of the stated hypotheses, and may be measured with appropriate precision to be sensitive to change resulting from ecological thinning treatments (Lindenmayer and Likens 2010). A brief rationale for each selected variable is provided, where possible with reference to relevant literature. The proposed monitoring methods are described in Appendix B.

3.2.1. Response variables relating to tree populations and forest structure

Hypothesis	Monitoring variable	Survey effort	Rationale for monitoring variable, where applicable
1a. Increased survival and growth rates of retained trees	Dbh of trees ≥10cm dbh	30 permanently marked trees ≥10cm dbh. Yearly.	Multiple dbh measurements over time allow the calculation of tree girth growth rates (Cunningham et al. 2009c; Horner et al. 2010; Kariuki 2008; Thomson et al. undated).
1a. Increased survival and growth rates of retained trees	Live/dead status of trees ≥10cm dbh	50 trees ≥10cm dbh. Yearly.	Monitoring a large subset of trees over time is more appropriate for providing information about population mortality rates than tracking mortality of individual trees.
1a. Increased survival and growth rates of retained trees	Survival of trees ≥80cm dbh	Every tree ≥80cm dbh in 2 ha plot. 5 yearly.	Monitoring a large subset of trees over time is more appropriate for providing information about population mortality rates than tracking mortality of individual trees.
1b. Increase the number and proportion of trees occurring in large diameter size classes	Distribution of trees amongst dbh size classes	All trees ≥10cm diameter in 3 x 0.25 ha plots. 5 yearly.	Trees will be allocated to dbh size classes in order to give information about the relative abundance of different cohorts in the population.
1c. Increased spread and hollow development rates	Number of trees with hollows	All hollow bearing trees in 2 ha plot. 5 yearly.	Counts of the number, size and distribution of tree hollows will allow an assessment of rates of hollow development (Adkins 2006; Gibbons et al. 2010; Horner et al. 2010; Thomson et al. undated; Vesk et al. 2008).
1c. Increased spread and hollow development rates	Opaque crown (m^2)	30 permanently marked trees ≥10cm dbh. 5 yearly.	The size of the opaque crown is indicative of both lateral branching and the spread of the canopy. It will assist in distinguishing trees that have a more branching versus straight form or habit.
1d. Increased tree canopy health (proportion of potential crown that's live)	Crown extent (%)	30 permanently marked trees ≥10cm dbhob. Yearly.	Crown extent is the proportion of the assessable crown area that supports living tissue. It reflects tree stress and branch senescence over recent months and, to some extent, recent years (Cunningham et al. 2007, 2009a; Souter et al. 2010).
1d. Increased tree canopy health (proportion of potential crown that's live)	PFC	Remotely sensed. Yearly.	Dead leaf material indicates declining canopy health through leaf die-off (Souter et al. 2010) and a loss of photosynthesising material (Stone and Bacon 1995).
1d. Increased tree canopy health (proportion of potential crown that's live)	of PFC, % that's dead	Remotely sensed. Yearly.	Dead leaf material indicates declining canopy health through leaf die-off (Souter et al. 2010) and a loss of photosynthesising material (Stone and Bacon 1995).

Hypothesis	Monitoring variable	Survey effort	Rationale for monitoring variable, where applicable
1d. Increased tree canopy health (proportion of potential crown that's live)	PAI hemispherical photos	Six photos per 2 ha plot. 5 Yearly.	PAI assesses canopy health via the density of leaves and stems within the site (Cunningham et al. 2007, 2009a; Souter et al. 2010).
1e. Increased recruitment of tree seedlings in early post-treatment years	Number of seedlings	All seedlings 3 x 0.04 ha subplots. Yearly.	Census of seedling recruitment and sapling growth and survival is essential to monitor tree population dynamics (George et al. 2005).
1f. Increased survival of saplings (> 1.3m; <10cm dbh)	Number of saplings and fate of individual saplings	All saplings in 3 x 0.04 ha plots. Yearly.	Sapling survival will be indicated by the number of seedlings that have survived to sapling stage, as well as the survival of saplings.
1g. Increased structural diversity of mid- and under-storey strata	Cover, abundance and height of dominant species in understorey strata	Dominant species in 3 x 0.04 ha plots. 5 Yearly.	Structural characteristics of each understorey stratum (e.g. sedge, grass and shrub strata) will be recorded, along with the dominant plant species.
1h. Maintain higher levels of coarse woody debris (at least 45 t/ha) in long term	Volume of coarse woody debris (≥10cm diameter)	All CWD in 3 x 0.25 ha plots. 5 Yearly.	The volume of each piece of CWD >10cm diameter will provide estimates of above ground mass of CWD (MacNally and Horrocks 2007) and allows examination of CWD by size class.
1i. Increased heterogeneity in cover and depth of forest litter in the long term	Cover of litter and bare ground	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	Visual estimates of leaf litter and bare ground will be indicative of the cover, and heterogeneity, in litter fall within plots.
1i. Increased heterogeneity in cover and depth of forest litter in the long term	Depth of forest litter	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	Measurements of litter depth will be informative for heterogeneity in litter depth, and combined with estimates of litter cover will be indicative of litter volume.
1j. Decreased persistence of stags in the short term	Count number of stags	All stags in 2 ha plot. 5 Yearly.	Stags (standing dead trees) will be monitored in the whole 2 ha plot.
1k. Increased fuel and fire risk	DSE Fuel assessment method	Yearly for first 5 years, then 5 yearly.	The method of Hines et al. (2010) is well established for assessing fuel hazards in south-eastern Australia.

3.2.2. Response variables relating to mammalian and avian diversity

Hypothesis	Monitoring variable	Survey effort	Rationale for monitoring variable
2a. Increase in diversity and increased levels of site utilisation by bat species	Species richness and diversity; use level by individual and all species	1 detector per 9 ha plot, for 2 nights. Yearly.	Bats are the major component of mammalian fauna in River Red Gum forests. As an easily recorded group of hollow dependent fauna, it is expected that changes in the utilisation and foraging activity levels both between and within bat species can provide insights into changes in the forest habitat.
2b. Increase in abundance and frequency of foraging activity by woodland bird species	Woodland birds	2 ha (100 m x 200 m) plot, searched for 20 minutes, pre- and post-9am. Yearly	Different bird species respond differently to stand structure, the availability of shrubs, etc (Johnson et al. 2007; Mac Nally et al. 2011). Therefore, changes in stand condition are expected to be reflected in short and medium term change in species diversity, abundance, number of species showing any breeding activities and total breeding activity summed over all species (Mac Nally et al. 2011). Reproductive status will also be recorded, as it is an important measure of habitat suitability and particular resource availability (Mac Nally 2006).
2c. Increased abundance of gliders	Number of trees with glider notches	9 ha plot. Yearly.	Some glider species leave distinct V shaped notches on trees when collecting sap (Smith and Murray 2003). The abundance of glider notches is indicative of use of the stand by gliders to forage.
2d. Increased abundance of predators, in particular foxes	Track or scat evidence	20 x 1m^2 plots in the 3 x 0.04 ha plots	Track count transects, track plates and faecal counts can detect temporal trends in abundance of predators within locations, and are particularly valuable in identifying long-term trends (Edwards et al. 2000; Wilson and Delahay 2001).

3.2.3. Response variables relating to vascular plant diversity

Hypothesis	Monitoring variable	Survey effort	Rationale for monitoring variable
3a. Increased diversity and cover of exotic plant species in understorey in the short term, decreased in the long term	Cover and abundance of all exotic plant species	3 x 0.04 ha plots. Yearly.	Vegetation surveys are used to characterise the structure and composition of the vegetation at a site. Replication over time can allow analysis of the species level response of the vegetation to habitat manipulations.
3a. Increased diversity and cover of exotic plant species in understorey in the short term, decreased in the long term	Abundance of all exotic species	20 x 1m2 plots within the 3 x 0.04 ha plots. Yearly.	Vegetation surveys are used to characterise the structure and composition of the vegetation at a site. Replication over time can allow analysis of the species level response of the vegetation to habitat manipulations.
3b. Increased	Cover and	3 x 0.04 ha plots.	See 3a. above. Brown et al. (2009) note that in drier,

Hypothesis	Monitoring variable	Survey effort	Rationale for monitoring variable
diversity and abundance of native plant species	abundance of all native plant species	Yearly.	more open forests such as River Red Gum forest, changes following increased light penetration may be smaller or slower than those observed in denser forest types.
3b. Increased diversity and abundance of native plant species	Abundance of all native species	20 x 1m2 plots within the 3 x 0.04 ha plots. Yearly.	See 3a. above. Brown et al. (2009) note that in drier, more open forests such as River Red Gum forest, changes following increased light penetration may be smaller or slower than those observed in denser forest types.

3.2.4. Other variables (covariates)

OTHER FEATURES Variable	Survey effort	Rationale
Mean ground water depth	Existing bores.	Groundwater data will be relevant to water availability.
Soil moisture	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	Soil moisture will be measured using a hand-held probe, and will provide useful information about the availability of water in the soil.
Elevation	9 ha plot. Once only.	Relevant to drainage which may have implications for local scale water availability.
Topography	9 ha plot. Once only.	
Basal area	3 x 0.04 ha plots. 5 yearly.	Basal area is relevant to understanding allocation of resources in the stand.
Heterogeneity in stem density	Pre-treatment only.	Understanding pre-treatment heterogeneity will be relevant for interpreting results.
Parasitism, disease or fungi on tree canopy or trunk	Opportunistic sightings.	Detect pathogens or susceptibility to parasites or disease that may arise from thinning operations.
Photo points	Six photographs at each of 3 x 0.04 ha plots. Yearly.	Photographs will be used to visually track change over time from fixed locations.

3.3. Layout of monitoring plots

A series of nested monitoring plots will be located within the treatment and control plots, to measure each response variable at the appropriate scale (Figure 3.1).

Within the 9 hectare plot, all hollow bearing trees and all stags (dead trees >40cm dbh) will be marked and counted prior to thinning, and a GPS location recorded.

A permanently marked 2 ha plot (200m x 100m, where possible) will be located in the centre of the plot for the bird surveys. A 200m centre line will be established within the 2 ha plot. The 30 permanently marked trees will be located within 5m either side of the centre line, as will the 50 trees categorised as live or dead. The location of the permanently marked trees will be recorded using a GPS and marked with a uniquely numbered durable metal tag.

Within the 2 ha plot, three 0.25 ha plots will be located for measuring CWD and the size class distribution of trees. These plots will not be permanently marked, but will be in the same location each survey period.

For the floristic surveys, three 0.04 ha (20m x 20m) monitoring subplots will located so as to sample the heterogeneity in the ground and shrub strata across the 9 ha plot. Where possible, any heterogeneity should be replicated in control and treatment plots (for example, each of the tree 9 ha plots may include a 0.04 ha subplot with a relatively wet understorey and a relatively dry understorey). The 0.04 ha plots will be permanently marked. To sample abundance of understorey plant species, as well as fox scats and litter variables, 20 x 1m^2 sub-plots will be located along one arm of the 0.04 ha plot.

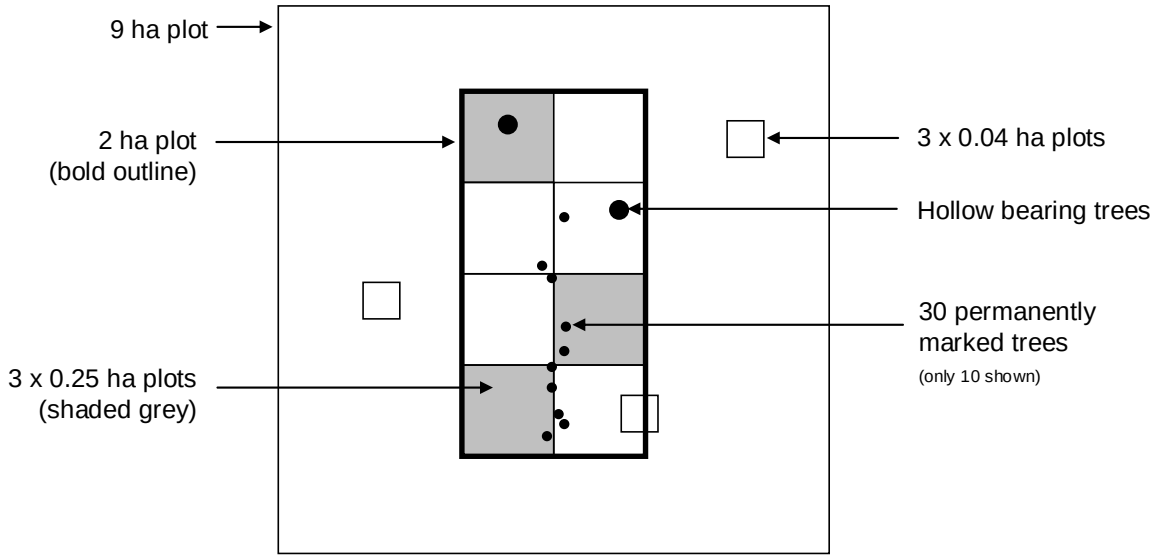


Figure 3.1. Placement of monitoring plots within treatment plot.

3.4. Timing of monitoring

All plots will be surveyed once pre-treatment. Post-treatment, all plots will be surveyed annually during spring for the first 5 years. Variables for which the hypothesis concerns long term change will be sampled in years 1 and 5 post-treatment only. After Year 5, a review will be carried out to determine the effectiveness of the surveys.

3.5. Training and precision

Training will be particularly important for selecting trees for retention and implementing the spacings in thinning treatments. The Operational Plan will be developed in collaboration by OEH, PV and DSE, and will detail specifics for implementing including: calculating spacings as an average across the 9 ha plot; decisions regarding coppiced and multi-trunked trees; descriptions of the on-ground notation for plot boundaries and retained trees. OEH (Parks and Wildlife Group) and PV staff will mark up all sites and consult extensively with contractors about protocols for tree felling and removal.

Precise estimates are required for monitoring variables, in particular dbh estimates for calculation of growth rates. Staff training, calibration exercises and double sampling by independent observers will be implemented to minimise error in dbh estimates. Training of

all field staff collecting monitoring data, including OEH and PV staff and external contractors, will occur at the commencement of each field season.

3.6. Expectations and limitations

The expected time frame for change in many of the parameters being monitored is in the order of decades. Lags for effects of management can be greater than one year, for many reasons: certain biological and physical processes simply take time; biological relicts persist even after conditions change; movements across the landscape take time; the simultaneous occurrence of two or more necessary conditions for an event or process to occur can be rare; and a chain of events accumulates the lags between cause-and-effect events (Magnuson 1990).

4. Reporting

Reporting of results from data analyses will be annual for the first five years, and five yearly thereafter. OEH, DSE and PV intend to collaborate to conduct data analyses and reporting, in consultation with an independent statistician.

5. Future

The results of this trial will inform on-going management of River Red Gum reserves, within adaptive management frameworks in both NSW and Victoria.

References

Aber J., Christensen H., Fernandez, I, Franklin J., Hidinger L., Hunter M., MacMahon J., Mladenoff D., Pastor J. Perry D. Slangen R. and van Miegroet H. (2000) Applying ecological principals to the management of the U.S. National Forests. Issues in Ecology Number 6: Spring.

Adkins M.F. (2006) A burning issue: using fire to accelerate tree hollow formation in *Eucalyptus* species. Australian Forestry 69(20): 107-113.

Allen C.D., Savage M., Falk D.A., Suckling K.F., Swetnam T.W., Schulke T., Stacey P.B., Morgan P., Hoffman M. and Klingel, J.T. (2002) Ecological restoration of Southwestern ponderosa pine ecosystems: a broad perspective. Ecological Applications 12: 1418-1433

ANBG (2011) Australian National Botanic Gardens website. http://www.anbg.gov.au/cpbr/WfHC/Eucalyptus-camaldulensis/index.html. Last updated 5 July 2004. First accessed 19/10/2011.

Archibald R.D., Bradshaw J., Bowen B.J., Close D.C., McCaw L., Drake P.L. and Hardy G.E.St.J. (2010) Understorey thinning and burning trials are needed in conservation reserves: The case of Tuart (*Eucalyptus gomphocephala* D.C.). Ecological Management and Restoration 11: 108-112.

Bacon P.E., Stone C. Binns D., Edwards D. and Leslie D. (1993) Relationships between water availability and growth in a riparian *Eucalyptus camaldulensis* forest. Journal of Hydrology 150: 541-561.

Ballinger A., Mac Nally R. and Lake P.S. (2010) Decay state and inundation history control assemblage structure of log-dwelling invertebrates in floodplain forests. River Research and Applications 26: 207-219.

Bassett O.D. and White G. (2001) Review of the impact of retained overwood trees on stand productivity. Australian Forestry 64(1): 57-63.

Bauhus J., Aubin I., Messier C., Connell M. (2001) Composition, structure, light attenuation and nutrient content of the understorey vegetation in a Eucalyptus sieberi regrowth stand 6 years after thinning and fertilization. Forest ecology and management 144: 275-286.

Bennett A.F., Lumsden L.F., Alexander J.S.A, Duncan P.E., Johnson P.G., Robertson P. and Silveira C.E. (1991) Habitat use by arboreal mammals along an environmental gradient in north-eastern Victoria. Wildlife Research 18(2): 125-46.

Bennett A.F., Lumsden L.F. and Nicholls A.O. (1994) Tree hollows as a resource for wildlife in remnant woodlands: Spatial and temporal patterns across the northern plains of Victoria, Australia. Pacific Conservation Biology 1: 222-235.

Bernardo A.L., Reis M.G.F., Reis G.G., Harrison R.B. and Firme D.J. (1998) Effect of spacing on growth and biomass distribution in *Eucalyptus camaldulensis*, *E. pellita* and *E. urophylla* plantations in southeastern Brazil. Forest Ecology and Management, 104: 1–13.

Bowen S., Powell M., Cox S. J., Simpson S.L. and Childs P. (2012) Riverina red gum reserves mapping program - Stage 1. NSW Office of Environment and Heritage.

Bren L.J. (1987) The duration of inundation in a flooding River Red Gum forest. Australian Forest Research 17: 191-202.

Bren L.J. (1988) Effects of river regulation on flooding of a riparian red gum forest on the River Murray, Australia. Regulated Rivers 2: 65-77.

Briggs S.V. and Maher M.T. (1983) Litter fall and leaf decomposition in a River Red Gum (*Eucalyptus camaldulensis*) swamp. Australian Journal of Botany 31: 307-16.

Brown G., Tolsma A., Murphy S., Miehs A., McNabb E. and York A. (2009) Ecological impacts of firewood collection – a literature review to infom firewood management on public land in Victoria. Arthur Rylah Institute for Environmental Research and Department of Forest and Ecosystem Science The University of Melbourne. Dated July 2010.

Campbell K.G. (1962) The biology of *Roeselia lugens* (Walk.), the gum-leaf skeletonizer moth, with particular reference to the *Eucalyptus camaldulensis* DEnh. (Rover Red Gum) forests of the murray valley region. Proceedings of the Linnean Society of NSW 87: 316-387.

Chesterfield E.A. (1986) Changes in the vegetation of the River Red Gum forest at Barmah, Victoria. Australian Forestry 49: 4-15.

Connell J. H. (1978) Diversity in tropical rain forests and coral reefs. Science 199: 1302–1310

Covington W.W., Fule P.Z., Hart S.C. and Weaver R.P. (2001) Modelling ecological restoration effects on Ponderosa Pine forest structure. Restoration Ecology 9: 421-431.

Cummings J. and Reid N. (2008) Stand-level management of plantations to improve biodiversity values. Biodiversity Conservation 17: 1187-1211.

Cunningham S.C., Read J., Baker P.J. and Mac Nally R. (2007) Quantitative assessment of stand condition and its relationship to physiological stress in stands of Eucalyptus camaldulensis (Myrtaceae). Australian Journal of Botany 55: 692-699.

Cunningham S.C., Mac Nally R., Read J., Baker P.J. White M., Thomson J.R. and Griffioen P. (2009a) A robust technique for mapping vegetation condition across a major river system. Ecosystems 12: 207-219.

Cunningham S.C., Mac Nally R., Griffioen P., White M. (2009b) Mapping the condition of River Red Gum and Black Box stands in The Living Murray icon sites. A milestone report to the Murray Darling Basin Authority. Murray Darling Basin Authority, Canberra.

Cunningham S.C., Baker P.J. and Horner G.J. (2009c) Proposed ecological thinning trials for River Red Gum forests in the middle Murray River floodplain in Victoria. Australian Centre for Biodiversity, School of Biological Sciences, Monash University, Melbourne.

Cunningham S.C., Thomson J.R., Read J. Baker P.J. and Mac Nally R. (2010) Does stand structure influence susceptibility of eucalypt forests to dieback? Austral Ecology 35: 348-356.

Cunningham S.C., Thomson J.R., Mac Nally R., Read J. and Baker P. (2011) Groundwater change forecasts widespread forest dieback across an extensive floodplain system. Freshwater Biology 56: 1494-1508.

Davis L.R., Puettmann K.J. and Tucker G.F. (2007) Overstory response to alternative thinning treatments in young Douglas-fir forests of western Oregon. Northwest Science 81: 1-14.

Deal R.L. (2007) Management strategies to increase stand structural diversity and enhance biodiversity in coastal rainforests of Alaska. Biological Conservation 137: 520-532.

DECC (2008) Reviewed interim Vegetation Condition benchmarks for the BioMetric tool. Department of Environment and Climate Change. Available at http://environment.nsw.gov.au/projects/biometrictool.htm

DECCW (2011) Review of Environmental Factors – Ecological Thinning trials in River Red Gum communities – Riverina Bioregion. March 2011. Prepared by Parks and Wildlife Group, Western Rivers Region.

del Moral and Muller (1970) The allelopathic effects of Eucalyptus camaldulensis. American Midland Naturalist 83(1): 254-282.

Dexter B.D. (1978) Silviculture of the River Red Gum forests of the central Murray flood plain. Proceedings of the Royal Society of Victoria 90: 175-191.

Di Stefano J. (2001) River red gum (Eucalyptus camaldulensis): a review of ecosystem processes, seedling regeneration and silvicultural practice. Australian Forestry 65(1): 14-22.

Duncan D.H. and Wintle B.A. (2008) Towards adaptive management of native vegetation in regional landscapes. *In* Pettit C. et al. (eds) Landscape analysis and visualization. Springer – Verlag GmbH, Berlin.

Dwyer J.M., Fensham R. and Buckley Y.M. (2010) Restoration thinning accelerates structural development and carbon sequestration in an endangered Australian ecosystem. Journal of Applied Ecology 47: 681-691.

Edwards G.P., de Preu N.D., Shakeshaft B.J. and Crealy I.V. (2000) An evaluation of two methods of assessing feral cat and dingo abundance in central Australia. Wildlife Research 27: 143-149.

FCNSW (1984) Notes on the silviculture of major NSW forests types – 5. River Red Gum. Forestry Commission of New South Wales, Sydney.

GB CMA (2011) Barmah Millewa Icon Site Environmental Water Management Plan. Prepared by Goulburn Broken CMA, 2 February 2011. Australian Government and Murray Darling Basin Authority.

George A.K. (2004) Eucalypt regeneration on the Lower Murray floodplain, South Australia. PhD Thesis, University of Adelaide.

George A.K., Walker K.F. and Lewis M.M. (2005) Population status of eucalypt trees on the River Murray floodplain, South Australia. River Research and Applications 21: 271-282.

Gibbons P. and Lindenmayer D. B. (1996) Issues associated with the retention of hollow bearing trees within eucalypt forests managed for wood production. Forest Ecology and Management 83: 245-279.

Gibbons P. and Lindenmayer D. B. (1997) Developing tree retention strategies for hollow-dependant arboreal marsupials in the wood production forests of eastern Australia. Australian Forestry 60: 29-45.

Gibbons P. and Lindenmayer D.B. (2002) Tree hollows and wildlife conservation in Australia. CSIRO Publishing, Melbourne.

Gibbons P., McElhinny C. and Lindenmayer D.B. (2010) What strategies are effective for perpetuating structures provided by old trees in harvested forests? A case study on trees with hollows in south-eastern Australia. Forest Ecology and Management 260: 975-982.

Graves A.T., Fajvan M.A. and Miller G.W. (2000) The effects of thinning intensity on snag and cavity tree abundance in an Appalachian hardwood stand. Canadian Journal of Forest Research 30(8): 1412-1220.

Green R.H. (1979) Sampling design and statistical methods for environmental biologists. Wiley Science, Chichester, England.

Hines F., Tolhurst K.G., Wilson A.A.G. and McCarthy G.J. (2010) Overall fuel hazard assessment guide: Fire and adaptive management. Report no. 82. 4th Edition July 2010. Victorian Department of Sustainability and Environment, Melbourne.

Horner G.J., Baker P.J., Mac Nally R., Cunningham S.C., Thomson J.R. and Hamilton F. (2009) Mortality of developing floodplain forests subjected to a drying climate and water extraction. Global Change Biology 15: 2176-2186.

Horner G.J., Baker P.J., Mac Nally R., Cunningham S.C., Thomson J.R. and Hamilton F. (2010) Forest structure, habitat and carbon benefits from thinning floodplain forests: Managing early stand density makes a difference. Forest Ecology and Management 259: 286-293.

Incoll W.D. (1979). Effects of overwood trees on growth of young stands of Eucalyptus sieberi. Australian Forestry 42 (2):110-116.

Jensen A.E., Walker K.F. and Paton D.C. (2008) The role of seedbanks in restoration of floodplain woodlands. River Research and Applications 24: 632-649.

Johnson M., Reich P. and Mac Nally (2007) Bird assemblages of a fragmented agricultural landscape and the relative importance of vegetation structure and landscape pattern. Wildlife Research 34: 185-193.

Jurskis V., Selby M., Leslie D. and Jurskis D. (2005) Health of River Red Gum, *Eucalyptus camaldulensis*, in NSW Central Murray State Forests. Forests NSW.

Kariuki M. (2008) Modelling the impacts of various thinning intensities on tree growth and survival in a mixed species eucalypt forest in central Gippsland, Victoria, Australia. Forest Ecology and Management 256: 2007-2017.

Kavanagh R. P. and Stanton M. A. (2003) Bird population recovery 22 years after intensive logging near Eden, New South Wales. Emu 103: 221-231.

Keith D. (2004) Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. NSW Department of Environment and Conservation, Hurstville.

Keith D.A., Martin T.G., McDonald-Madden E. and Walters C. (2011) Uncertainty and adaptive management for biodiversity conservation. Biological Conservation 144: 1175-1178.

Killey P., McElhinny C., Rayner I. and Wood, J. (2010) Modelling fallen branch volumes in a temperate eucalypt woodland: implications for large senescent trees and benchmark loads of coarse woody debris. Austral Ecology 35: 956-968.

Kingsford R. T. (2000) Ecological impacts of dams, water diversions and river management on floodplain wetlands in Australia. Austral Ecology 25: 109-127.

Lada H., Mac Nally R. and Taylor A.C. (2008) Responses of a carnivorous marsupial (*Antechinus flavipes*) to local habitat factors in two forest types. Journal of Mammalogy 89(2): 398-407.

Leslie D. (2005). Is the Superb Parrot *Polytelis swainsonii* population in Cuba State forest limited by hollow or food availability? Corella 29: 77-87.

Lindenmayer D.B. and Likens G.E. (2010) Effective ecological monitoring. CSIRO Publishing, Collingwood, Victoria.

Lindenmayer D.B., Cunningham R.B., Pope M.L. Gibbons P. and Donnelly C.F. (2000) Cavity sizes and types in Australian eucalypts from wet and dry forest types – a simple rule of thumb for estimating size and number of cavities. Forest Ecology and Management 137: 139-150.

Mac Nally R. (2006) Longer-term response to experimental manipulation of fallen timber on forest floors of floodplain forest in south-eastern Australia. Forest Ecology and Management 229: 155-160.

Mac Nally R. and Horrocks G. (2002) Habitat change and restoration: responses of a floodplain forest-floor mammal species to manipulations of fallen timber in forests. Animal Biodiversity and Conservation 1: 41–52.

Mac Nally R. and Horrocks G. (2007) Inducing whole assemblage change by experimental manipulation of habitat structure. Journal of Animal Ecology 76: 643-650.

Mac Nally R., Parkinson A., Horrocks G., Conole L. and Tzaros C. (2001) Relationships between terrestrial vertebrate diversity, abundance and availability of coarse woody debris on Southeastern Australian floodplains. Biological Conservation 99: 191-205.

Mac Nally R., Parkinson A., Horrocks G. and Young M. (2002) Current loads of Coarse Woody Debris on Southeastern Australian floodplains: Evaluations of change and implications for restoration. Restoration Ecology 10(4): 627-635.

Mac Nally R., Cunningham S.C., Baker P.J., Horner G.J. and Thomson J.R. (2011) Dynamics of Murray-Darling floodplain forests under multiple stressors: The past, present, and future of an Australian icon. Water Resources Research 47:1-11. American Geophysical Union, Washington USA.

Magnuson J.J. (1990) Long term ecological research and the invisible present. Bioscience 40(7): 495-501.

McHenry M.T., Wilson B.R., Lemon J.M., Donnelly D.E. & Growns I.G. (2006) Soil and vegetation response to thinning White Cypress Pine (Callitris glaucophylla) on the North Western Slopes of New South Wales, Australia. Plant and Soil 285, 245-255.

MDBA (2009) Factsheet: The Living Murray Program. Murray Darling Basin Authority, Canberra.

MDBC (2006) The Barmah-Millewa Forest Icon Site Environmental Management Plan 2006-2007. MDBC Publication No. 30/06. Murray-Darling Basin Commission, Canberra.

MDBMC (1995) An audit of water use in the Murray-Darling Basin. Murray-Darling Basin Ministerial Council.

Neyland M.G. and LaSala A.V. (2005) Response of understorey floristics to pre-commercial thinning and fertilising in even-aged eucalypt regeneration. Tasforests 16: 71-82.

Nicholson A.J. (1954) An outline of the dynamics of animal populations. Australian Journal of Zoology 2(1): 9-65.

NRC (2009a) River Red Gums and Woodland Forests: Riverina Bioregion Regional Forests Assessment. Recommendations Report. Natural Resources Commission. December 2010. Sydney, NSW.

NRC (2009b) Riverina Bioregion Regional Forest Assessment: River Red Gums and other woodland forests. Final Assessment Report. December 2009. Sydney, NSW.

O'Neill M.G. and Taylor R.J. (1986) Observations on the flight patterns and foraging behaviour of Tasmanian bats. Australian Wildlife Research 13: 427-432.

Pennay M. (2009) Assessment of River Red Gum and woodland forest health in the New South Wales Riverina Bioregion using Multi-temporal Landsat TM data generated from the Statewide Landcover and Trees Study (SLATS). Department of Environment, Climate Change and Water, Queanbeyan.

Pigott P., Brown G., Gibson M., Palmer G., Tolsma A. and Yen A. (2009) Large-scale habitat restoration in Box-Ironbark Forests using ecological thinning. In : SERI 2009 World Conference on Ecological Restoration. 19th Conference of the Society of Ecological Restoration International. Conference Abstracts. p. 104, Perth, Western Australia. Accessed online 15/11/2011 - https://www.ser.org/pdf/Abstracts_SERI_Perth.pdf

Pigott J.P., Palmer G.P., Yen A.L., Tolsma A.D., Brown G.W., Gibson M.S. and Wright J.R. (2010) Establishment of the Box-Ironbark ecological thinning trial in North Central Victoria. Proceedings of the Royal Society of Victoria 122(2): 111-122.

PV (2009) Active Forest Health Project. Parks Division, Parks Victoria. 22 June 2009.

Quinn G. P. and Keough M.J. (2002) Experimental design and data analysis for biologists. Cambridge University Press, Cambridge.

Recher H.F. (1991) The conservation and management of eucalypt forest birds: resource requirements for nesting and foraging. In Lunney D. (Ed) Conservation of Australia's Forest Fauna, The Royal Zoological Society of New South Wales, Sydney. pp 25-34.

Recher H.F. (1996) Conservation and management of eucalypt forest vertebrates. in De Graaf R.M. and Miller R.I. (Eds.) Conservation of faunal diversity in forested landscapes. Chapman and Hall.

Recher H.F., Majer J.D. and Ganesh S. (1996) Eucalypts, arthropods and birds: on the relation between foliar nutrients and species richness. Forest Ecology and Management 85(1-3): 177-195.

Roberts J. and Marston F. (2000) Water regime of wetland and floodplain plants in the Murray-Darling Basin. A sourcebook of ecological knowledge. CSIRO Land and Water, Canberra.

Roberts J. (2001) Large plants. In Young W.J. (Ed) Rivers as ecological systems – the Murray Darling Basin, pp 187-221. Murray Darling Basin Commission, Canberra.

Robertson A.I. and Rowling R.W. (2000) Effects of livestock on riparian zone vegetation in an Australian dryland river. Regulated Rivers: Restoration and Management 16: 527-541.

Robertson A.I., Bacon P. and Heagney G. (2001) The responses of floodplain primary production to flood frequency and timing. Journal of Applied Ecology 38: 126-136.

Robinson A. (2011) Review of ecological thinning study design. Unpublished report prepared for the NSW Office of Environment and Heritage.

Rotheram I. (1983). Suppression of growth of surrounding regeneration by veteran trees of karri (*Eucalyptus diversicolor*). Australian Forestry 46 (1): 8-13.

Rumpff L., Duncan D.H., Vesk P.A., Keith D.A. and Wintle B.A. (2011) State and transition modelling for adaptive management of native woodlands. Biological Conservation 144: 1224-1236.

Schonau A.P.G. and Coetzee J. (1989) Initial spacing, stand density and thinning in eucalypt plantations. Forest Ecology and Management 29:245-266.

Simard S.W. and Hannam K.D. (2000) Effects of thinning overstory paper birch on survival and growth of interior spruce in British Columbia: implications for reforestation policy and biodiversity. Forest Ecology and Management 129: 237-251.

Smith A.P. and Murray M. (2003) Habitat requirements of the squirrel glider (*Petaurus norfolcensis*) and associated possums and gliders on the New South Wales central coast. Wildlife Research 30: 291-301.

Souter N.J. Cunningham S., Little S., Wallace T., McCarthy B. and Henderson M. (2010) Examination of a visual assessment method for tree condition of eucalypt floodplain forest. Ecological Management and Restoration 11: 210-214.

Souter N.J., Watts R.A., White M.G. George A.K. and McNicol K.J. (2009) Method manual for the visual assessment of Lower River Murray Floodplain trees. River Red Gum (Eucalyptus camaldulensis). DWLBC report 2009/25, Government of South Australia, through Department of Water, Land and Biodiversity Conservation, Adelaide.

State Forests of NSW (2001) Native Forest Silviculture Manual. State Forests of NSW, Sydney (unpublished).

Stewart-Oaten A., Murdoch W.M. and Parker K.R. (1986) Environmental impact assessment: "pseudoreplication" in time? Ecology 67: 929-940.

Stone C. and Bacon P.E. (1994) Relationships among moisture stress, insect herbivory, foliar cineole content and the growth of River Red Gum *Eucalyptus camaldulensis*. Journal of Applied Ecology 31: 604-612.

Stone C. and Bacon P.E. (1995) Leaf dynamics and insect herbivory in a *Eucalyptus camaldulensis* forest under moisture stress. Australian Journal of Ecology 20: 473-481.

Tappeiner J.C., Huffman D., Marshall D., Spies T.A. and Bailey J.D. (1997) Density, ages and growth rates in old-growth and young-growth forests in coastal Oregon. Canadian Journal of Forest Research 27: 638-648.

Thomson J., Horrocks G., Cunningham S. and Mac Nally R. (undated) Modelling tree hollow availability over time in the Barmah landscape zone. A report to the Goulburn-Broken CMA. Australian Centre for Biodiversity, School of Biological Sciences, Monash University. Unpublished.

Thysell D.R. and Carey A.B. (2001) Manipulation of density of Pseudotsuga menzeisii canopies: preliminary effects on understory vegetation. Canadian Journal of Forest Research 31: 1513-1525.

Tidemann C.R. and Flavel S.C. (1987) Factors affecting choice of diurnal roost site by Tree-Hole Bats (*Mictochirotera*) in south-eastern Australia. Australian Wildlife Research 14: 459-473.

Underwood A.J. (1994) On beyond BACI: Sampling designs that might reliably detect environmental disturbances. Ecological Applications 4(1): 3-15.

VEAC (2008) River Red Gum Forests Investigation. Final Report. Victorian Environmental Assessment Council, East Melbourne.

Vesk P.A., Nolan R., Thomson J.R., Dorrough J.W. and Mac Nally R. (2008) Time lags in provision of habitat resources through revegetation. Biological Conservation 141: 174-186.

Water Technology (2005) Barmah-Millewa forest hydrodynamic model. Report J129/R01 Rev 1. Water Technology, Notting Hill, Vic.

Water Technology (2009) Barmah-Millewa hydrodynamic modelling: Model recalibration. Report J727/R01. Water Technology, Notting Hill, Vic. Dated August 2009.

Water Technology (2011) Murray Darling Basin Authority, hydrodynamic modelling of Barmah-Millewa forest. Report 1882-01/R01. Water Technology, Notting Hill, Vic. Dated August 2011.

Wilson G. J. and Delahay R. J. (2001) A review of methods to estimate the abundance of terrestrial carnivores using field signs and observation. Wildlife Research 28: 151-164.

Walshe T., Rumpff L. and Gorrod E. (2011) Expert judgment of the ecological response of Barmah-Milewa communities to manipulation of stand structure and surface water. Unpublished report on outcomes of a workshop held 18 – 19 August 2011 at Moama.

Zagas T.D., Ganatsas P.P., Tsitsoni T.K. and Tsakaldimi M. (2004) Thinning effect on stand structure of holm oak stand in northern Greece. Proceedings of the 10th International Mediterranean Ecosystems Conference, 25 April – 1 May 2004, Greece. Pp 1-9.

Appendix A: Hypothesis rationales

It is anticipated that the effects of thinning will be greater in the heavy thinning treatment, and will be greater on sites with higher levels of water availability.

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
1a. Increased survival and growth rates of retained trees	Tree diameter at breast height over bark (>10cm dbhob)	Thinning is postulated to reduce competition for water amongst retained trees (and light, space and nutrient resources to a lesser extent), making more resources available to retained trees to grow at a faster rate. It is anticipated that heavier thinning will provide the greatest reduction in competition and hence the greatest growth response (Karuki 2008).	Thinning can increase tree growth rates (Davis et al. 2007; Cunningham et al. 2009c), presumably due to reduced competition for resources. In a thinning trial in River Red Gum forests, higher median and maximum dbh rates were associated with greater thinning intensities (Horner et al. 2010). Schonau and Coetzee (1989) stated: it can be accepted that mean breast height diameter increases with a reduction in stocking (Opie et al. 1984).
1a. Increased survival and growth rates of retained trees	Tree height	As for growth in dbh, it is anticipated that reduced competition for resources will enabled faster growth rates in height of retained trees.	Tree height was not measured as a response variable in the thinning study in River Red Gum forests reported by Horner et al. (2010). There is some evidence that the number of hollows is inversely proportional to the square root of tree height for Eucalypts (Lindenmayer et al. 2000).
1a. Increased survival and growth rates of retained trees	Survival of trees >10cm DBH	Reduced competition for resources amongst retained trees is postulated to allow a greater proportion of trees to obtain sufficient resources to complete their lifecycle.	In high-density stands of River Red Gum, allocation to tap root growth is reduced, making the trees more susceptible to drought-induced mortality (Horner et al. 2009). Although thinning may initially result in a transient (one to two year) increase in mortality of small trees due to thinning stress (Karuki 2008), there is evidence that in the longer term, thinned stands have lower mortality than unthinned stands (Davis et al. 2007; Horner et al. 2009, 2010; Karuki 2008) apparently due to increased water availability (Horner et al. 2010). Unthinned stands have been found to undergo significant increases in drought related mortality when compared with thinned stands (Davis et al. 2007; Cunningham et al. 2009a).

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
1a. Increased survival and growth rates of retained trees	Survival of trees >80cm DBH	Large trees have a high capacity to utilise increases in available water (and other resources) resulting from thinning and will therefore have increased rates of survival.	Karuki (2008) found that large trees have disproportionately higher access to resources, particularly light, resulting in increased survival of large trees in thinned plots. The likelihood of tree survival has been found to be correlated with tree size (Karuki 2008) and stand density (Horner et al. 2009, 2010; Karuki 2008), with mortality higher in unthinned stands than thinned stands.
1b. Increase the number and proportion of trees occurring in large diameter size classes	Distribution of trees amongst DBH size classes	Removal of trees <40cm dbh will increase the proportion of trees in larger diameter size classes. This hypothesis relates to the recruitment of trees into larger size classes (>60cm dbh) over time. These trees are more likely to become hollow bearing than narrower stems.	Horner et al. (2010) reported that stand dbh distributions differed among all thinning treatments, 42 years post treatment. Unthinned stands were dominated by many slender trees, mostly in the <25 cm dbh classes, whereas thinned stands produced a higher proportion of large trees, resulting in negatively skewed distributions and higher median and maximum dbh values.
1c. Increased spread and hollow development rates	Number of trees with hollows (min 5 cm)	Thinning is anticipated to decrease competition for space and light, which may allow the development of open, crown structures with larger, heavier branches rather than tall straight trees. Coupled with increases in dbh, increases in the number and density of hollow-bearing trees in thinned stands are predicted.	Thinned treatments have been shown to support a higher density of hollow-bearing trees (Horner et al. 2010). Reducing tree densities is anticipated to increase development rates of girth and large boughs, and these factors facilitate the development of hollow-bearing trees (Bennett et al. 1994; Thomson et al. undated; Vesk et al. 2008).
1c. Increased spread and hollow development rates	Opaque crown (m^2)	As a result of increased lateral braching (and increased tree crown extent discussed below), reduced competition for resources may allow increase in the spread of the crown of River Red Gum trees.	As outlined in 1b. open, spreading crowns are not developed in high-density stands of trees (Vesk et al. 2008).
1d. Increased tree canopy health (proportion of potential crown that's live)	Tree crown extent: the proportion of the assessable crown area that supports living tissue.	The expected reduction in competition and water stress through thinning is predicted to result in improved measures of canopy health.	To reduce water demand, River Red Gum trees shed leaves to reduce leaf area (Gibson et al 1994 cited in Souter et al. 2009; Roberts 2001). Defoliation due to water stress reduces both crown extent and density (Souter et al. 2009). River Red Gums under reduced water stress have been found to have larger, denser crowns (Stone and Bacon 1994). Crown vigour

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
			is a reliable indicator of tree vigour and stand condition (Cunningham et al. 2007). Crown expansion is likely in River Red Gums, as apical dominance in River Red Gum is weak (FCNWS 1984; Horner et al. 2010).
1d. Increased tree canopy health (proportion of potential crown that's live)	Projective foliage cover (remotely sensed)	Reduction of competition for water and other resources through thinning may increase allocation of resources to producing greater numbers of larger leaves in the canopy.	River Red Gums under moisture stress have been found to produce significantly smaller and fewer leaves (Stone and Bacon 1994).
1d. Increased tree canopy health (proportion of potential crown that's live)	of PFC, % that's dead (remotely sensed)	Reduction of competition for water and other resources through thinning may decrease the proportion of dead foliage in the canopy.	Trees which have been recently flooded, and are hence under reduced water stress, have been found to have significantly less dead tissue per shoot (Stone and Bacon 1995).
1d. Increased tree canopy health (proportion of potential crown that's live)	Plant Area Index (hemispherical photos)	Reduction of competition for water and other resources through thinning may increase area of leaves and stems in the canopy.	As outlined above, River Red Gums under reduced water stress have larger, denser crowns through increased levels of leaf and shoot production, increased mean leaf size and increased rates of leaf retention (Stone and Bacon 1995).
1e. Increased recruitment of tree seedlings in early post-treatment years	Seedling establishment	The reduction of competition from larger trees and the provision of gaps may facilitate increased seedling establishment in thinned stands.	Recruitment of River Red Gum seedlings has been very limited in River Red Gum forests for numerous decades (Mac Nally et al. 2011). In high density stands, trees have arguably formed an almost contiguous zone of influence, preventing seedling germination. The limiting factors for recruitment by River Red Gum populations are post-germination survival of seedlings, and sapling growth through the subsequent stresses of climate and competition (ANBG 2011, Dexter 1978). The process model workshop highlighted uncertainty regarding whether thinning would stimulate a recruitment event (Walshe et al. 2011).
1f. Increased survival of seedlings (<1.3m) and saplings (> 1.3m; <10cm dbh)	Sapling survival	The reduction of competition for light, space, water and nutrient resources will increase sapling survival in thinned stands.	River Red Gum populations are not limited by germination, but by the survival of seedlings (ANBG 2011). Very few seedlings survive environmental stresses in the River Red Gum habitat and conditions for survival occur infrequently (Dexter 1978). The availability of water is greatly reduced within the zone of influence of trees, which may extend to 40m

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
			around a mature tree. In the absence of competition seedling survival is 20-30 times greater (Dexter 1978).
1g. Increased structural diversity of mid- and under-storey strata	Cover and abundance of dominant spp in understorey strata	The understorey of River Red Gum Forest is typically patchy with a sparse shrub layer. It is, however, predicted that reduced competition for space and other resources will increase the number of understorey strata, and the cover of each stratum.	The effects of thinning on understorey structure are poorly understood, and have not been studied in River Red Gum forests to our knowledge. Evidence from other ecosystems indicates that increased cover and abundance of understorey strata is plausible (Cummings and Reid 2008; Dwyer et al. 2010).
1h. Maintain higher levels of coarse woody debris (45-50 t/ha) in long term	Volume of coarse woody debris (tonnes/ha)	CWD will be increased as part of the thinning treatment, but it is postulated that higher levels of CWD will be maintained over the longer term due to the development of larger, branching trees with heavy boughs.	Levels of CWD averaging about 40-50 t/ha, but with a high variance (patchiness), have been identified by MacNally et al. (2001) as a suitable interim target to achieve biodiversity outcomes. Vesk et al. (2008) identify boughs as the major source of fallen timber, and Killey et al. (2010) predict that the bulk of fallen branch debris is produced by large (>100 cm DBH) senescing trees.
1i. Increased heterogeneity in cover and depth of forest litter in the long term	Percent cover of litter and bare ground	Increased canopy vigour in thinned stands will increase the cover and depth of forest litter. Heterogeneity may increase due to increased patchiness in the canopy.	NRC (2009b) suggested that thinning in River Red Gum forests could reduce deposition rates of leaf litter. However, reduced water stress has been found to increase the vigour of tree canopies, which in turn increased the turnover of canopy foliage and increased deposition rates of litter (Stone and Bacon 1995).
1i. Increased heterogeneity in cover and depth of forest litter in the long term	Depth of litter	Increased canopy vigour in thinned stands will increase the cover and depth of forest litter. Heterogeneity may increase due to increased patchiness in the canopy.	NRC (2009b) suggested that thinning in River Red Gum forests could reduce deposition rates of leaf litter. However, reduced water stress has been found to increase the vigour of tree canopies, which in turn increased the turnover of canopy foliage and increased deposition rates of litter (Stone and Bacon 1995).
1j. Decreased persistence of stags in the short term	Count of stags	Opening up the canopy is anticipated to increase expose of the stand to wind and may decrease the persistence of stags.	Due to the high density of the wood, it is expected that dead River Red Gums will remain standing and providing hollows for habitat for more than a decade (Cunningham et al. 2010), possibly for as long as to 50 yrs after they die (Gibbons et al. 2010). Gibbons (1994, cited in Gibbons and Lindenmayer 1996) showed that

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
			retained trees were more likely to remain standing as the basal area of live stems within the immediate 30 m of the tree increased. Snags (Canadian parlance for stags) were reportedly 2-4 times less abundant in heavily thinned stands than control stands in a hardwood plantation in Canada (Graves et al. 2000).
1k. Increased fuel and fire risk	DSE fuel assessment method (Hines et al. 2010)	Ecological thinning is expected to increase fire risk though increased levels of fine fuel in the understorey and increased CWD.	The net outcome of thinning on fuel loads is poorly understood (NRC 2009b). Litter loads are expected to increase due to increased vigour of the canopy (Stone and Bacon 1995), but NRC (2009b) suggest that thinning in River Red Gum forests could reduce deposition rates of leaf litter. Fine fuels derived from grasses and increased levels of CWD are likely to be higher in thinned forests (NRC 2009b).
2a. Increase in diversity and increased levels of site utilisation by bat species	Bats	Ecological thinning will increase habitat heterogeneity and resource availability, and hence increase the abundance and diversity of bat species utilising the stand. It is predicted that changes in the density of tree spacings, canopy and understorey characteristics will to have an impact on the utilisation and foraging activity levels both between and within bat species, and that bat activity may also vary with different forest health levels.	Bats are a major component of hollow-dependent fauna (Tidemann and Flavel 1987) in RRG forests, and including the threatened Fishing bat. Bats are known to favour large diameter trees in RRG forests (Lumsden et al. 2002). Variation in bat activity may at different levels of forest health has been observed at Yanga (M. Pennay pers. comm.). There is evidence that bat activity is dependent on foliage structure (not specific to RRGs) (O'Neill and Taylor 1986). Some bats are known to forage within the shrub layer, or between the shrub and canopy strata (O'Neill and Taylor 1986, not specific to RRGs).
2b. Increase in abundance and frequency of foraging activity by woodland bird species	Woodland birds	Ecological thinning will increase habitat heterogeneity and resource availability, and hence increase the abundance and diversity of diurnal bird species utilising the stand for foraging and breeding activity.	Improvement of stand condition (*sensu* Cunningham et al. 2009a) had a positive effect on bird species diversity, abundance, number of species showing any breeding activities and total breeding activity summed over all species (Mac Nally et al. 2011). Habitats with sparse foliage will usually support relatively few nest sites compared to habitats with a complex vegetation profile and dense foliage (Recher 1991). Indigenous bird species are likely to benefit from increased CWD density (>40 tonnes per hectare), as well as high variance in wood loads (Pickett and Cadenasso 1995; Mac Nally et al. 2011), including that of species not

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
			considered to be dependent on ground layer structure (Mac Nally and Horrocks 2007). The capacity of trees to provide food resources for birds such as flowers, leaves and insects depends on structural and floristic complexity, which varies with site productivity (Recher et al. 1996). Different bird species respond differently to stand structure, availability of shrubs etc (Mac Nally et al. 2011). Bird assemblage structure is known to be influenced substantially more by vegetation characteristics than by the landscape context of sites (Johnson et al. 2007).
2c. Increased abundance of gliders	# of trees w glider notches	Greater numbers of larger leaves, higher availability of flowers and other foraging resources are considered likely to increase the utilisation of thinned sites by gliders for foraging.	Glider species are known to forage on leaves, plant exudates and invertebrates. They are most frequently observed foraging in the canopy, but may also utilise ground resources (Bennett et al. 1991). Many species are dependent on tree hollows as diurnal resting sites and breeding sites (Tyndale-Biscoe and Calaby 1975, cited in Bennett et al. 1991). On the central coast of NSW, the abundance of all possums and gliders increased significantly with canopy height, canopy cover, the number of mature and old-growth trees and the number of trees with hollows (Smith and Murray 2003).
2d. Increased abundance of predators, in particular foxes, in the short term	Track or scat evidence (fox)	There is the possibility that reducing stem density will make the forest more permeable to predators. However, this effect may be largely negated by increased cover of coarse woody debris.	There is little available evidence in the published literature to inform this hypothesis. Smith et al. 1992 'felt that roading associated with logging may enable foxes to penetrate forest habitats from which they would otherwise be excluded and predation by foxes on ground dwelling or nesting fauna may be a major reason for the decline of these animals in logging areas. Although they lacked conclusive data, Claridge et al. (1991) thought that disturbance associated with logging led to increased predation on bandicoots by foxes and dogs in SE NSW'. (cited in Recher 1996)
3a. Increased diversity and cover of exotic plant species in understorey in the short term, decreased in the long	Cover and abundance of all exotic plant spp	In the short term, it is possible that increased availability of water, space, light and nutrient resources (due to decreased competition), coupled with disturbance associated with the thinning treatment,	Thinning trials in Brigalow vegetation did not result in invasion of exotic grasses in regrowth (particularly buffel grass) (Dwyer et al. 2010). Thinning in Eucalyptus sieberi regrowth was also not observed to facilitate an increase in exotic understorey plant species (Bauhus et al. 2001). In a wet sclerophyll forest plantation, growth of both native and exotic species was

Hypothesis	Monitoring variable	Rationale for hypothesis (process model)	Evidence supporting hypothesis
term		may increase the diversity and cover of exotic plant species. In the long term, it is postulated that native plant species will survive flood events and benefit from reduced competition to the detriment of exotic species.	stimulated by thinning (Cummings and Reid 2008).
3b. Increased diversity and abundance of native plant species	Cover and abundance of all native plant spp	The response of native understorey plant species is quite uncertain, but it is postulated that the increased availability of water, space, light and nutrient resources (due to decreased competition) will facilitate increases in cover and abundance of native plant species, and may also increase the diversity of species per unit area.	The understorey of River Red Gum forest is known to be patchy and can be species rich (Keith 2004). In a site in the more xeric west of the Murray River floodplains, the richness of native understorey plants was strongly negatively associated with canopy coverage (Mac Nally et al. 2011). In Box-Ironbark communities in Victoria, increased cover was recorded for some classes of understorey flora including tussock grasses and forbs, which were responding to increased availability of light following thinning (Pigott et al. 2009). Thinning more than doubled species richness in wet sclerophyll forest plantation (Cummings and Reid 2008). Woody species and grass cover were significantly higher post-thinning in Brigalow (Dwyer et al 2010). Brown et al. (2009) note that in drier, more open forests such as River Red Gum forest, changes may be smaller or slower than those observed in denser forest types. Bauhus et al. (2001) found no significant changes in understorey composition or cover following thinning. They indicate that this is in contrast to other studies and that it is difficult to generalise thinning responses of plant life-forms across a range of forest ecosystem types. Responses are likely to vary with resilience of the stand (Cummings and Reid 2008) vegetation type, thinning scale, intensity of treatment and individual characteristics of the understorey species (Bauhaus et al 2001; Brown et al 2009).

Appendix B: Field survey monitoring methods

All variables will be measured once pre-treatment and within a year of treatment completion. Thereafter, variables will be measured either yearly or 5 yearly.

1. Features relating to forest structure and tree populations

SURVIVAL AND GROWTH RATES OF RETAINED TREES

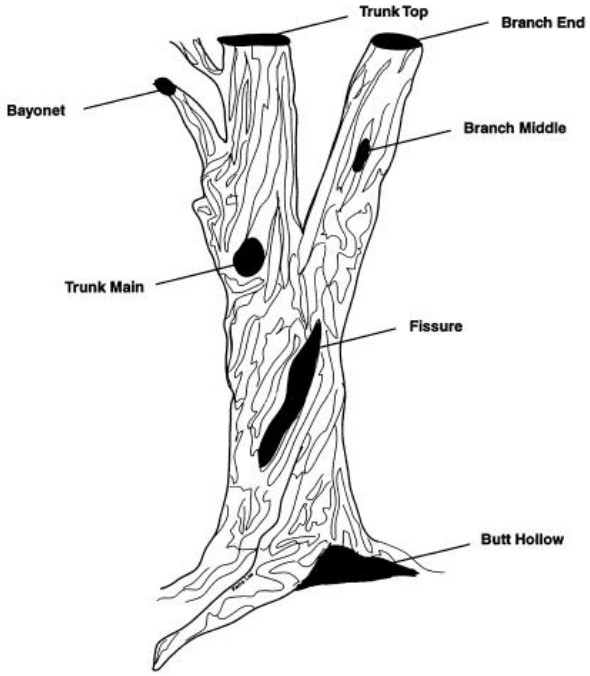
Variable	Survey effort	Method
Tree dbhob Diameter at breast height over bark. Breast height is 1.3 m above the ground measured along the stem.	30 permanently marked trees ≥10cm dbh. Yearly.	Where the tree is on a slope (or lean), 1.3 m is measured on the uphill side (or on the underside) of the tree. Where a swelling occurs at 1.3 m, two points unaffected by swellings or limbs equally spaced above and below 1.3 m should be selected, measured then averaged to give an estimate of dbhob. If the tree has multiple stems, the dbhob of each stem is to be recorded. 1. Gently clear lichen or loose bark so as not to remove any firm bark from the tree. 2. Place the tape at 90° to the axis of the stem at 1.3 m above ground, walking the tape around the tree to ensure that it is level. 3. Measure dbhob to the nearest mm. If dbhob is <10 cm, ignore and move on to the next tree; if dbhob is ≥10 cm record the measurement. 4. Paint the point(s) on the tree where the measurement(s) have been made. A subset of trees will be re-sampled each field season to estimate observer error in dbhob estimates.
Live/dead status of trees (>10cm dbh)	50 trees ≥10cm. Yearly.	1. Allocate tree to category: "Dead" tree is defined as a tree that has no live (green) foliage. "Live" tree is classed as a tree that has live foliage.
Live/dead status of large trees (>80cm dbh)	Every tree ≥80cm dbh in the 2 ha plot. Yearly.	1. Allocate tree to category: "Dead" tree is defined as a tree that has no live (green) foliage. "Live" tree is classed as a tree that has live foliage.

[1] Record the GPS locations of each of the 30 trees selected for tree parameter assessments, and the accuracy (Estimated Position Error, EPE) of the GPS reading.

PROPORTION OF TREES IN LARGE DIAMETER SIZE CLASSES

Variable	Survey effort	Method
Distribution of trees amongst DBH size classes	All trees in 3 x 0.25 ha plots. 5 yearly.	1. Use calibrated callipers to allocate each stem within the 0.25 ha plot to a diameter class: <10cm; 10.1-20cm; 20.1-30cm; 30.1-40cm; 40.1-50cm; 50.1-60cm; 60.1-70cm; 70.1-80cm; 80.1-90cm; 90.1-100cm; >100cm

SPREAD AND HOLLOW DEVELOPMENT

Variable	Survey effort	Method
Number of trees with hollows A hollow is defined as having a 5cm diameter entrance.	All hollow bearing trees in 2 ha plot. 5 yearly.	1. Using binoculars, determine whether a tree has one or more hollows, using the diagram below (from Lindenmayer et al. 2000) as a guide.  2. Record species, if other than *Eucalyptus camaldulensis*. 3. Determine whether tree is live or dead. 4. If live, record: a. Number of hollows in each of three size classes: Small (5–10 cm), Medium (10–15 cm) and Large (>15 cm). b. Dbhob to the nearest cm, using the method described above. 5. If dead, allocate to category (standing sound, standing weak, branch fall, total collapse). 6. GPS the location of the hollow bearing tree, and the accuracy (EPE) of the GPS reading.
Opaque crown (m^2) Opaque crown is the perimeter of individual crowns, treated as a solid object.	30 trees ≥10cm dbhob. 5 yearly.	1. Estimate the diameter of the crown in two perpendicular planes, to the nearest 0.5m. 2. Opaque crown of the same trees will also be measured on aerial photos using image analysis software (exact method yet to be determined).

TREE CANOPY HEALTH

Variable	Survey effort	Method
Tree crown extent Crown extent is the proportion of the assessable crown area that	30 trees ≥10cm dbhob. Yearly.	1. Determine the Assessable Crown, which is defined as all live branches and foliage, and dead branches. Branches that have leaves at their base and middle (e.g. with epicormic growth) may be counted as living tissue even if their tips

Variable	Survey effort	Method
supports living tissue. Assessable crown is all live and dead branches. Crown extent is equivalent to crown vigour as defined by Cunningham et al. (2007).		support no foliage. Trees should be viewed from several angles to make an estimate of assessable crown, preferably locations with a clear view of the whole crown. 2. Record the Crown Extent (including epicormic growth) as the amount of living tissue relative to the Assessable Crown. Two or more observers should independently record an estimate of crown extent percentage to within 5 %. See Souter et al. (2009) for illustrative examples of crown extent.
Projective foliage cover Projective foliage cover is equivalent to the vertical shadow cast by an individual crown's photosynthetic material.	Remotely sensed. Yearly.	This will be measured using a remote sensing technique, yet to be determined. Possible options include SPOT.
Of projective foliage cover, % that is dead	Remotely sensed. Yearly.	This will be measured using a remote sensing technique, yet to be determined. Possible options include SPOT.
Plant Area Index Plant Area Index is defined as the area of leaves and stems per unit ground area, without adjustment for clumping of canopy components (Cunningham et al. 2007).	Five photos in the 2 ha plot. 5 Yearly.	Hemispherical photographs must be taken only during either the 90 minutes after sunrise or the 90 minutes before sunset to avoid direct sunlight on the canopy. Photographs with excessive sunlight in the canopy or on the trunks will lead to substantial underestimates of PAI. Excessive sunlight can sometimes be removed by positioning the camera such that the sun is behind the trunk of a large tree. 1. Set up and level the tripod and camera at 1.3 m height at the permanently marked photograph position in the centre of the 0.25 ha plot. 2. Using a digital camera and fisheye lens adaptor, take a photograph with the lens pointing at 90° to the horizontal plane. The camera and lens type must be consistent across plots and over time. 3. Record the required information including the filename/number on the hemispherical photograph record sheet. 4. Use image analysis software (Multispec and Winphot) to estimate PAI.

SURVIVAL OF SEEDLINGS AND SAPLINGS

Variable	Survey effort	Method
Seedling establishment Seedlings are <1.3m in height.	All seedlings within 3 x 0.04 ha subplots. Yearly.	1. GPS and tag each seedling, up to 200 seedlings. 2. If seedlings of species other than Eucalyptus camaldulensis are present, record numbers of seedlings separately. 3. If more than 200 seedlings are present, note their approximate locations within the 0.04 ha plot only.
Sapling survival Saplings are >1.3m height and dbhob <10cm.	All saplings in 3 x 0.04 ha plots. Yearly.	1. GPS and tag each sapling. 2. If saplings of species other than Eucalyptus camaldulensis are present, record numbers of saplings separately.

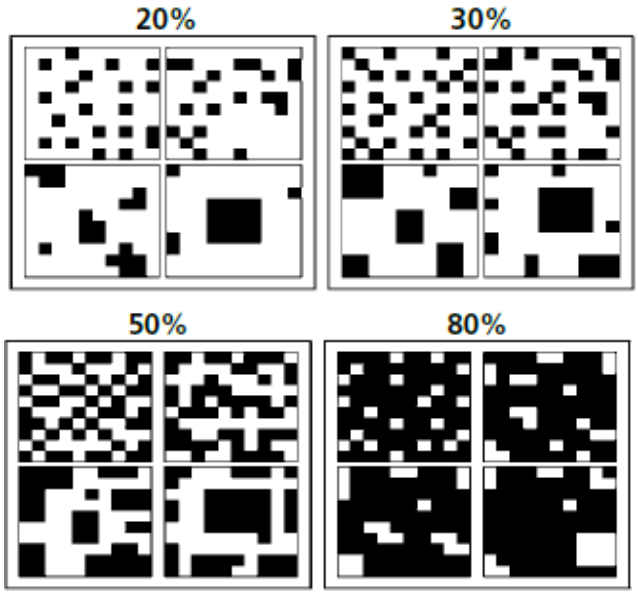
STRUCTURAL DIVERSITY OF MID- AND UNDER-STOREY STRATA

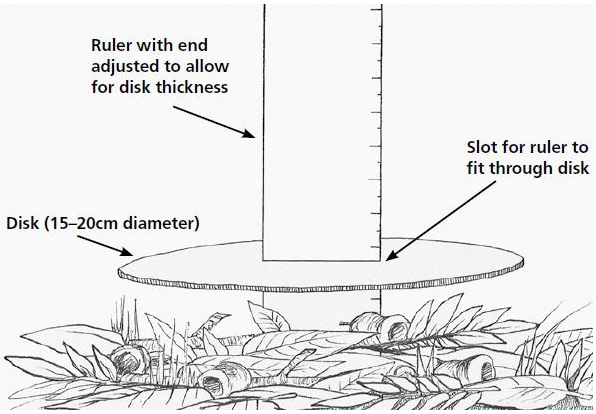
Variable	Survey effort	Method
Cover, abundance and height of dominant species in understorey strata	Dominant species in 3 x 0.04 ha plots. 5 Yearly.	1. Record number of strata present in understorey 2. Record dominant species in each stratum of the understorey and the average, maximum and minimum heights for each stratum (to the nearest 0.5m). 3. Estimate projective foliage cover for each species listed in 2, to the nearest 5%. 4. Estimate abundance of each species listed in 2, using the scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000. Numbers above about 20 are estimates only; specify a number greater than 1000 if required.

COARSE WOODY DEBRIS

Variable	Survey effort	Method
Volume of coarse woody debris (≥10cm diameter)	All CWD in 3 x 0.25 ha plots. 5 Yearly.	1. Measure mid point diameter and length of all CWD ≥10cm diameter debris pieces (Mac Nally et al. 2002), including only CWD within the 0.25 ha plot (if a debris piece extends beyond the plot, record only the diameter and length of the portion within the plot). 2. Calculate the volume of CWD, assuming that debris pieces are cylindrical.

LITTER

Variable	Survey effort	Method
Cover of forest litter and bare ground	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	1. Estimate % cover of litter and % bare ground, using the guide below in which each quarter in any one square has the same % cover (from Hines et al. 2010). 

Variable	Survey effort	Method
Depth of forest litter	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	1. At one point within the 1m^2 plot, estimate litter depth to the nearest mm, using the method described in Hines et al. (2010). Using a ruler and a circular disc 150mm in diameter (as shown below, from Hines et al. 2010), make a small gap in the litter-bed down to mineral soil and rest the end of the ruler on the mineral soil surface. Push the disc down with a very light pressure until its whole perimeter is in contact with the fuel, and read off the ruler level with the top of the disc.  Note that the end of the ruler beyond the scale must be adjusted to match the thickness of the disc.

PERSISTENCE OF STAGS

Variable	Survey effort	Method
Count of standing dead trees (stags) A stag is defined as a canopy-less, bark-less, light grey standing dead tree >40cm dbh.	All stags in 2 ha plot. 5 Yearly.	1. Most stags will have been identified as dead hollow bearing trees in the hollow bearing tree assessment described above. 2. Record the GPS (and accuracy of GPS reading) of any stags that are >40cm dbh but are not hollow bearing. 3. Allocate each stag to a category: standing sound, standing weak, branch fall, total collapse.

RISK OF FIRE

Variable	Survey effort	Method
Risk of fire	Five yearly	1. Apply DSE fuel assessment method, as described in Hinds et al. (2010).

2. Features relating to mammalian and avian diversity

The monitoring of fauna should be undertaken before and after treatments are implemented during seasons when the relevant species group is most readily detectable. Whilst spring is the best time to undertake most fauna surveys it is recognised that access may be restricted by periodic wet weather or forest flooding. In this instance surveys will be conducted during summer/autumn when access is improved.

MAMMALIAN AND AVIAN DIVERSITY

Variable	Survey effort	Method
Diversity of and utilisation by bat species Measures recorded: species present, species diversity, use level by species (number of calls by each species); overall use level (total number of calls by site).	1 detector per 9 ha plot, for at least 1 night. Preferably autumn or summer. Yearly.	1. Place Anabat detector in centre of the 9 ha plot in the evening. Survey all plots in each cluster of control and treatment plots on the same night (one detector in each) to negate weather effects between the control and treatments. 2. Return the next morning to collect Anabat and extract data. 3. Analyse calls using Anascheme software.
Abundance and frequency of use by woodland bird species	Permanent 2 ha (100 m x 200 m) plot, searched for 20 minutes. Spring. Yearly.	1. All species and the number of individuals observed or heard on the plot will be recorded (as per Webster 2005). 2. Each site surveyed twice per season: One pre 9am and one post 9am. 3. Record nesting / breeding activity.
Abundance of gliders	9 ha plot. Yearly.	1. Count the number of trees with glider notches, record the GPS location (and accuracy of GPS reading).
Permeability for predators	10 x 1m^2 plots in the 3 x 0.04 ha plots	1. Record evidence of tracks or scats

3. Features relating to diversity and abundance of flora

DIVERSITY AND ABUNDANCE OF FLORA

Variable	Survey effort	Method
Diversity and abundance of exotic plant species	3 x 0.04 ha plots. Yearly.	1. Estimate projective foliage cover to the nearest 5% for all exotic plant species. 2. Record abundance for all exotic plant species on the following scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000. Numbers above about 20 are estimates only; specify a number greater than 1000 if required.
Diversity and abundance of exotic plant species	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly	1. Within each 1m^2 plot along one arm of the 0.04 ha plot, record the each exotic species present, and the number of individuals of each species.
Diversity and abundance of native plant species	3 x 0.04 ha plots. Yearly.	1. Estimate projective foliage cover to the nearest 5% for all native plant species. 2. Record abundance for all native plant species on the following scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000. Numbers above about 20 are estimates only; specify a number greater than 1000 if required.
Diversity and abundance of native plant species	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly	1. Within each 1m^2 plot along one arm of the 0.04 ha plot, record the each native species present, and the number of individuals of each species.

4. Other features

OTHER FEATURES

Variable	Survey effort	Method
Mean ground water depth	—	From existing piezometers, not located within plots.
Soil moisture	20 x 1m^2 plots within 3 x 0.04 ha plots. Yearly.	Use a soil moisture meter at one location within each 1m2 subplot.
Elevation	9 ha plot. Once only.	Measure elevation and slope of 9 ha site using a clinometer.
Topography	9 ha plot. Once only.	Provide a description of topography.
Basal area	3 x 0.04 ha plots	Basal area will be calculated from the distribution of trees amongst dbh size classes.
Heterogeneity in stem density	Pre treatment only	Provide a detailed description of distribution of stems within the 9 ha plot. GPS the boundaries of dense patches of River Red Gum within more open areas.
Photo points	3 photos per 20 x 20 m plot	From the starting peg, take one photo looking along each arm of the 20 x 20 m plot, and another looking diagonally across the plot.
Parasitism/disease/fungi on canopy or trunk	Yearly	Opportunistic sightings of parasitism, disease or fungi on the canopy or trunk of trees, including mistletoe. Any damage to retained trees sustained in the thinning treatments should be recorded.

Appendix 2 ï Coordinates for trial components

Ecological Thinning Trial in New South Wales and Victorian River Red Gum Forests

Appendix 2 – Coordinates for trial components

Notes

C – Control plot

M – Moderate thinning

H – Heavy Thinning

All coordinates in GDA94 Zone 55

All routes for transportation of excess felled material are as shown in the addendum to the PER.

Plot #	**Easting**	**Northing**
1 - C	311662.8	6015176.9
1 - C	311961.8	6015176.9
1 - C	311663.3	6014876.4
1 - C	311962.8	6014876.9
1 - H	311269.1	6014834.0
1 - H	311569.1	6014833.5
1 - H	311569.1	6014534.0
1 - H	311269.1	6014533.5
1 - M	312163.7	6015189.9
1 - M	312464.2	6015189.9
1 - M	312163.7	6014889.9
1 - M	312464.2	6014889.9
2 - C	313216.0	6027458.0
2 - C	313516.0	6027458.0
2 - C	313516.0	6027158.0
2 - C	313216.0	6027158.0
2 - H	313495.0	6028058.0
2 - H	313796.0	6028058.0
2 - H	313796.0	6027758.0
2 - H	313495.0	6027758.0
2 - M	313394.0	6027049.0
2 - M	313694.0	6027049.0
2 - M	313694.0	6026750.0

Plot #	Easting	Northing
2 - M	313394.0	6026750.0
3 - C	317378.9	6037989.1
3 - C	317679.1	6037988.6
3 - C	317679.6	6037689.9
3 - C	317379.4	6037689.4
3 - H	316827.4	6038037.2
3 - H	317127.2	6038037.2
3 - H	317127.7	6037737.9
3 - H	316827.4	6037737.9
3 - M	316654.3	6037625.1
3 - M	316954.0	6037625.1
3 - M	316954.0	6037325.9
3 - M	316654.3	6037325.4
4 - C	322058.1	6034851.3
4 - C	322358.0	6034851.3
4 - C	322358.0	6034551.4
4 - C	322058.1	6034551.4
4 - M	321994.1	6035289.0
4 - M	322293.2	6035289.5
4 - M	322293.7	6034989.4
4 - M	321994.1	6034989.4
4 - H	321532.2	6034753.4
4 - H	321832.1	6034753.4
4 - H	321832.1	6034453.5
4 - H	321532.2	6034453.5
5 - C	322761.8	6035531.4
5 - C	323061.8	6035531.4
5 - C	323061.8	6035231.8
5 - C	322761.8	6035231.8
5 - M	323259.4	6035208.6

Plot #	Easting	Northing
5 - M	323559.4	6035208.6
5 - M	323559.4	6034909.1
5 - M	323259.8	6034908.7
5 - H	323264.0	6034636.7
5 - H	323563.9	6034636.7
5 - H	323564.6	6034336.8
5 - H	323264.0	6034336.8
6 - C	321688.6	6032158.3
6 - C	321988.6	6032158.3
6 - C	321988.6	6031857.3
6 - C	321688.6	6031857.3
6 - M	321848.1	6031737.6
6 - M	322148.1	6031737.6
6 - M	322148.1	6031437.1
6 - M	321848.1	6031437.7
6 - H	322126.4	6032331.2
6 - H	322425.8	6032331.2
6 - H	322426.3	6032031.3
6 - H	322126.4	6032031.3
7 - C	328397.8	6036115.7
7 - C	328697.5	6036115.7
7 - C	328697.9	6035816.1
7 - C	328397.8	6035815.6
7 - M	328911.2	6035970.5
7 - M	329210.7	6035970.5
7 - M	329210.7	6035670.1
7 - M	328911.2	6035670.1
7 - H	328487.4	6035689.9
7 - H	328787.3	6035689.9
7 - H	328787.7	6035390.0

Plot #	Easting	Northing
7 - H	328487.0	6035390.0
8 - C	328588.1	6034547.3
8 - C	328887.4	6034547.3
8 - C	328887.4	6034247.2
8 - C	328587.3	6034247.2
8 - M	328704.5	6035043.9
8 - M	329003.4	6035044.3
8 - M	329004.2	6034745.0
8 - M	328704.5	6034744.2
8 - H	329027.6	6034663.7
8 - H	329327.7	6034663.7
8 - H	329327.7	6034363.6
8 - H	329027.6	6034363.6
9 - M	330323.1	6035997.8
9 - M	330622.1	6035997.8
9 - M	330622.1	6035698.8
9 - M	330323.1	6035698.8
9 - H	330612.7	6036422.7
9 - H	330912.7	6036423.2
9 - H	330912.7	6036122.7
9 - H	330612.7	6036122.7
9 - C	330795.6	6036018.6
9 - C	331095.6	6036018.6
9 - C	331096.1	6035719.2
9 - C	330795.6	6035719.2
10 - C	332597.5	6037127.3
10 - C	332896.9	6037127.3
10 - C	332897.3	6036827.5
10 - C	332597.5	6036827.5
10 - M	332080.4	6037083.0

Plot #	Easting	Northing
10 - M	332380.5	6037082.5
10 - M	332380.5	6036782.8
10 - M	332080.4	6036782.8
10 - H	331595.5	6037031.2
10 - H	331896.1	6037031.2
10 - H	331895.6	6036731.1
10 - H	331595.5	6036731.1
11 - C	331202.2	6035276.0
11 - C	331501.8	6035276.0
11 - C	331202.2	6034976.3
11 - C	331502.5	6034976.9
11 - M	331778.9	6035611.6
11 - M	332079.0	6035611.6
11 - M	332079.0	6035311.6
11 - M	331778.9	6035312.1
11 - H	331297.0	6035676.1
11 - H	331597.1	6035676.1
11 - H	331597.1	6035376.0
11 - H	331297.5	6035376.0
12 - C	332382.3	6034324.8
12 - C	332681.5	6034324.8
12 - C	332682.4	6034024.7
12 - C	332382.3	6034024.7
12 - M	332185.5	6034734.1
12 - M	332485.8	6034734.1
12 - M	332485.2	6034434.3
12 - M	332185.5	6034434.3
12 - H	332447.1	6033864.1
12 - H	332746.4	6033864.1
12 - H	332746.4	6033564.0
12 - H	332446.7	6033564.0

Plot #	Easting	Northing
13 - C	342283.8	6033185.5
13 - C	342583.7	6033485.4
13 - C	342584.2	6033185.5
13 - C	342283.8	6033185.5
13 - M	342684.7	6033815.0
13 - M	342984.7	6033815.0
13 - M	342984.7	6033515.0
13 - M	342685.1	6033515.0
13 - H	342913.7	6033383.8
13 - H	343214.1	6033383.8
13 - H	343214.1	6033083.8
13 - H	342913.7	6033083.8
14 - C	340771.5	6034328.0
14 - C	341072.1	6034328.0
14 - C	341071.7	6034027.4
14 - C	340771.5	6034027.4
14 - M	341239.4	6034127.0
14 - M	341539.6	6034127.0
14 - M	341539.2	6033827.2
14 - M	341239.4	6033827.2
14 - H	341697.6	6033849.9
14 - H	341997.4	6033849.9
14 - H	341997.4	6033549.7
14 - H	341697.2	6033549.7
15 - C	314028.1	6012655.6
15 - C	314327.6	6012656.2
15 - C	314328.8	6012356.6
15 - C	314028.7	6012356.0
15 - M	313496.9	6013315.1
15 - M	313796.7	6013315.1
15 - M	313496.7	6013015.5

Plot #	Easting	Northing
15 - M	313797.1	6013015.5
15 - H	313619.0	6012914.5
15 - H	313618.4	6012615.3
15 - H	313918.8	6012915.0
15 - H	313919.5	6012614.4
16 - C	315404.6	6024625.3
16 - C	315704.8	6024325.1
16 - C	315404.6	6024324.7
16 - C	315704.8	6024624.5
16 - M	315004.1	6024444.3
16 - M	315304.3	6024443.5
16 - M	315304.3	6024144.1
16 - M	315004.1	6024143.7
16 - H	315806.5	6024675.4
16 - H	316106.7	6024674.6
16 - H	316106.7	6024375.1
16 - H	315806.5	6024374.7
17 - C	314849.4	6027169.7
17 - C	315149.7	6027168.9
17 - C	315149.7	6026869.4
17 - C	314849.4	6026869.4
17 - M	314411.4	6027054.7
17 - M	314712.0	6027055.1
17 - M	314711.6	6026755.0
17 - M	314411.4	6026755.0
17 - H	314138.6	6027518.6
17 - H	314438.3	6027518.2
17 - H	314438.3	6027218.0
17 - H	314138.6	6027218.0
18 - M	314614.6	6029185.5
18 - M	314914.2	6029185.5

Plot #	Easting	Northing
18 - M	314614.6	6028885.5
18 - M	314914.6	6028885.5
18 - H	315051.3	6028963.3
18 - H	315351.2	6028963.3
18 - H	315351.2	6028663.3
18 - H	315051.3	6028663.3
18 - C	315174.8	6028562.9
18 - C	315474.8	6028562.9
18 - C	315474.8	6028262.9
18 - C	315174.8	6028262.9
19 - C	312719.6	6033804.5
19 - C	313019.6	6033804.5
19 - C	312719.6	6033504.6
19 - C	313019.5	6033504.6
19 - M	313176.0	6033772.8
19 - M	313475.6	6033772.8
19 - M	313476.3	6033473.2
19 - M	313176.0	6033473.2
19 - H	313064.7	6034304.7
19 - H	313065.4	6034304.7
19 - H	313365.4	6034004.8
19 - H	313064.4	6034005.2
20 - M	317970.9	6037997.2
20 - M	318271.2	6037996.4
20 - M	318271.2	6037696.6
20 - M	317970.9	6037696.6
20 - C	318470.4	6037603.9
20 - C	318770.6	6037603.1
20 - C	318770.6	6037303.6
20 - C	318470.4	6037303.2
20 - H	318375.0	6038011.8

Plot #	Easting	Northing
20 - H	318675.2	6038011.0
20 - H	318675.2	6037711.6
20 - H	318375.0	6037711.2
21 - M	325612.1	6039735.5
21 - M	325612.5	6039435.5
21 - M	325912.5	6039435.5
21 - M	325911.8	6039735.9
21 - H	325194.1	6039964.4
21 - H	325494.3	6039963.7
21 - H	325194.7	6039663.6
21 - H	325494.9	6039964.2
21 - C	325614.6	6040170.0
21 - C	325915.7	6039870.7
21 - C	325914.6	6040170.6
21 - C	325615.2	6039870.7
22 - C	324415.5	6033428.3
22 - C	324715.6	6033428.3
22 - C	324716.0	6033127.8
22 - C	324415.5	6033127.8
22 - H	325263.6	6033246.1
22 - H	325563.7	6033246.1
22 - H	325563.7	6032946
22 - H	325263.6	6032946
22 - M	324825.8	6033112.1
22 - M	325125.9	6033112.1
22 - M	325125.9	6032811.6
22 - M	324825.8	6032811.6

Site	Easting	Northing
NSW Stockpile Site	315575.27	6033594

Appendix 3 ï Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report

Australian Government

Department of the Environment

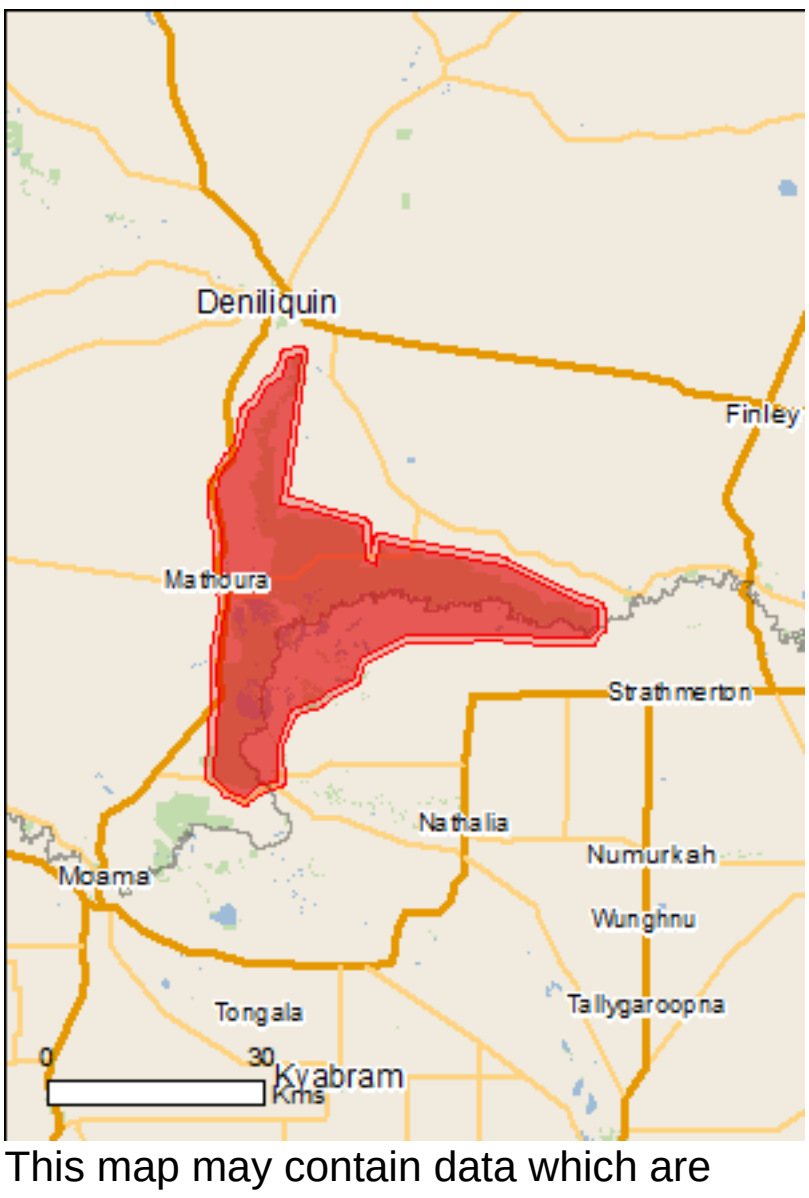
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

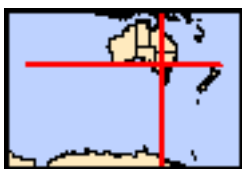
Report created: 19/11/13 09:32:29



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	6
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	20
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	3
State and Territory Reserves:	8
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR) [Resource Information]

Name	Proximity
Banrock station wetland complex	Upstream from Ramsar
Barmah forest	Within Ramsar site
Coorong and lakes alexandrina and albert	Upstream from Ramsar
Gunbower forest	Upstream from Ramsar
Nsw central murray state forests	Within Ramsar site
Riverland	Upstream from Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Pedionomus torquatus Plains-wanderer [906]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Breeding known to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Craterocephalus fluviatilis		
Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area
Maccullochella macquariensis		
Trout Cod [26171]	Endangered	Species or species habitat likely to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Nyctophilus corbeni		
South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Plants		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Brachyscome muelleroides		
Mueller Daisy [15572]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tensa		
Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area
Lepidium monoplocoides		
Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area
Myriophyllum porcatum		
Ridged Water-milfoil [19919]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Xanthomyza phrygia Regent Honeyeater [430]	Endangered*	Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Barmah and Millewa Forests	NSW	Registered
Indigenous		
Algeboia Midden	NSW	Registered
Cumeroogunga Reserve / Maloga Mission Area	NSW	Registered

State and Territory Reserves [Resource Information]

Name	State
Barmah	VIC
Moira Lakes	NSW
River Murray Reserve	VIC
Sanddune Pine	NSW
Top End	VIC
Top Island	VIC
Toupna Creek	NSW
Unnamed FMZ1	NSW

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Barmah-Millewa Forest	VIC
Broken Creek	VIC
Millewa Forest	NSW

Coordinates

-36.010173 144.890071,-35.929038 144.898311,-35.907907 144.895564,-35.884545 144.896937,-35.857837 144.902431,-35.8378 144.907924,-35.833347 144.907924,-35.805508 144.901057,-35.764288 144.901057,-35.740884 144.892818,-35.721933 144.892818, -35.702977 144.902431,-35.69517 144.909297,-35.689593 144.913417,-35.676208 144.923777,-35.640502 144.934016,-35.636038 144.945003,-35.615945 144.957362, -35.60478 144.976588, 35.592497 144.982082, 35.585796 144.983495,-35.583563 144.999534,-35.754196 144.975215,-35.740884 145.008174,-35.744228 145.021907, -35.756488 145.076839,-35.791028 145.079585,-35.797711 145.094691,-35.773202 145.098811,-35.778779 145.126277,-35.797711 145.258993,-35.825558 145.318538, -35.836667 145.355918,-35.841421 145.369455,-35.850045 145.376723,-35.861176 145.387723, -36.871192 145.399737,-35.871192 145.513045,-35.867893 145.264979,-35.886674 145.237514,-35.867893 145.194942,-35.867893 145.163356,-35.867893 145.133144, -35.887882 145.078212,-35.897893 145.069972,-35.911243 145.065852,-35.926814 145.03152,-35.932374 145.02328,-35.942381 144.986201,-35.980174 144.969722,-35.986841 144.969722,-36.014616 144.971093,-36.01906 144.949123,-36.032387 144.929896, -36.025724 144.911067,-36.01906 144.902431,-36.010173 144.890071

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. Lands mapped as Commonwealth land and Commonwealth waters are based on current knowledge and may not be accurate. Importance Caveats may apply to listed threatened migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix 4 – Summary report for site surveys

NSW GOVERNMENT Office of Environment & Heritage

Ecological Thinning Trial in New South Wales and Victorian River Red Gum Forests

Appendix 4 – Summary report for site surveys

Summary report on Threatened species and habitat features traverses as part of Pre-thinning Trials in River Red Gum Forests

Site Number 1

Date(s) surveyed 30 May 2012

Table 1 Habitat features

Values	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Hollow bearing trees <1m dbh	18	23	10
Hollow bearing trees >1m	18	13	7
Stags (>1m) or <1m with hollows	45	44	35
Total hollows	**81**	**80**	**52**
Glider Feed trees	-	1	-
Raptor or waterbird nests	1 medium sized raptor nest	-	-

Comments

Lots of large fallen trees and young regrowth throughout

Spotlight and call playback surveys

Species	**Count No. 1 30/5/12**	**Count No. 2 20/6/12**	**Count No. 3 10/1/13**
Barn Owl	X	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	X	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-

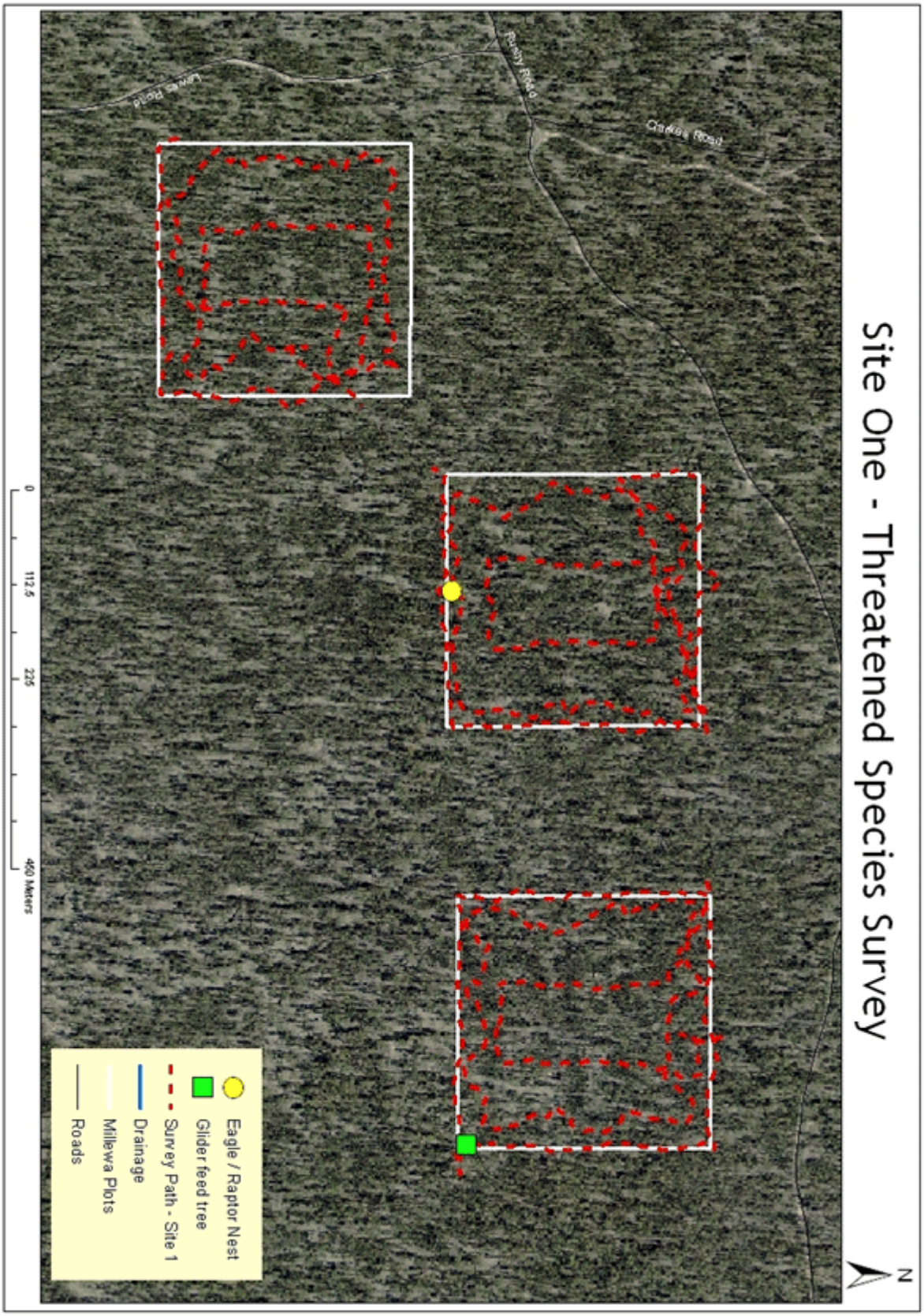
Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	-
Azure Kingfisher	X	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Crested Pigeon	-	-	-
Crested Shrike-tit	X	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	X
Fantail Cuckoo	-	-	-
Galah	X	-	X
Golden Whistler	-	-	-
Grey Fantail	-	X	-
Grey Shrike-thrush	X	X	X
Jacky Winter	-	X	X
Laughing Kookaburra	X	X	-
Little Friarbird	-	-	-
Little Raven	X	X	X
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	-	-
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	-
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	X
Striated Thornbill	-	X	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	-	-	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-plumed Honeyeater	X	X	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	X	X
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Yellow-footed Antechinus	-	X	X
Eastern Grey Kangaroo	X	X	X

Figure 1 Plot route and features



Site Number 2

Date(s) surveyed 31 May 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	55	43	24
Hollow bearing trees >1m	13	20	21
Stags (>1m) or <1m with hollows	20	35	45
Total hollows	**88**	**98**	**90**
Glider Feed trees	-	-	-
Raptor or waterbird nests	-	-	1 (large eagle)

Comments

2-1 Many live LHB trees, especially < 1mdbh, including several (5+) without obvious hollows

2-2 Many live LHB trees, especially < 1mdbh

2-3 Contains large (e.g. Wedgie or Sea-eagle) nest in Stag

Spotlight and call playback surveys

Species	Count No. 1 30/5/12	Count No. 2 20/6/12	Count No. 3 10/1/13
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	X	X	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	X	-
White-striped Mastiff Bat	X	X	X
Tawny Frogmouth	-	-	X

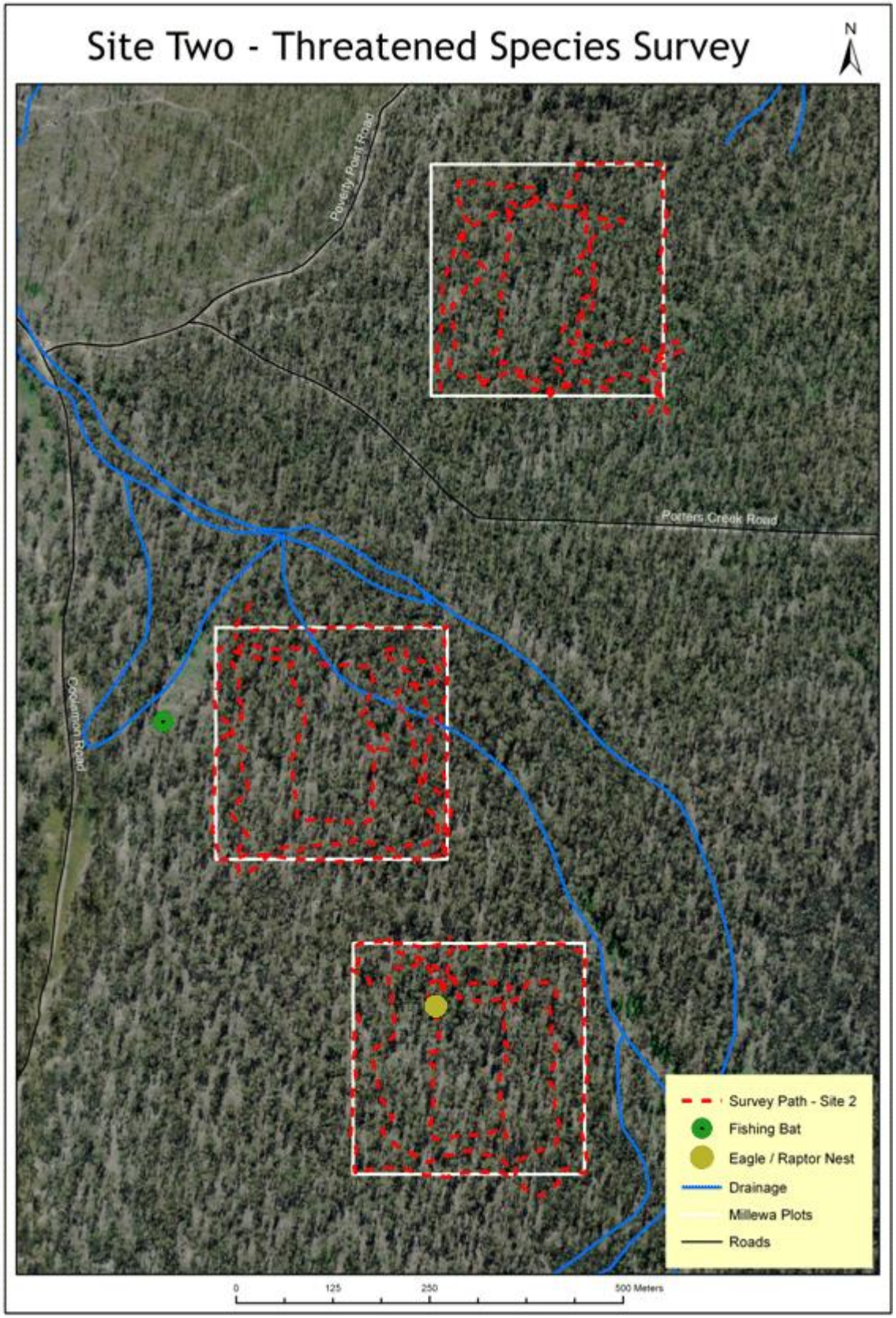
Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	X	-	-
Australian Raven	X	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	X	X	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Buff-rumped Thornbill	X	X	-
Crested Pigeon	-	-	-
Crested Shrike-tit	X	X	-
Dusky Woodswallow	-	X	-
Eastern Rosella	-	-	-
Emu	-	-	X
Fantail Cuckoo	-	-	-
Galah	X	X	X
Golden Whistler	-	-	-
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	X
Jacky Winter	X	X	X
Laughing Kookaburra	X	-	-
Little Friarbird	-	-	X
Little Raven	-	-	X
Long-billed Corella	-	-	X
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	X
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	X	-
Red Wattlebird	-	-	-
Restless Flycatcher	X	-	X
Rufous Whistler	-	-	-
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	X	-
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	X
Striated Thornbill	X	X	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	X	X
Tree Martin	X	X	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	-	-	-
Welcome Swallow	-	X	X
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	X
White-plumed Honeyeater	X	X	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	X	X	X
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	X	-	-

Figure 2 Plot route and features survey



Site Number 3

Date(s) surveyed see below

Table 1 Habitat features

Values	Plot No. 1 12/12/12	Plot No. 2 11/12/12	Plot No. 3 11/12/12
Hollow bearing trees <1m dbh	10	13	16
Hollow bearing trees >1m	7	4	8
Stags (>1m) or <1m with hollows	14	15	19
Total hollows	**31**	**32**	**43**
Glider Feed trees	-	-	-
Raptor or waterbird nests	1	-	-

Comments

3-1 Possible raptor nest

Spotlight and call playback surveys

Species	Count No. 1 5/6/12	Count No. 2 6/6/12	Count No. 3 13/1/13
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	X	X	X
Australian Raven	-	X	X
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	X	-
Brown-headed Honeyeater	-	X	X
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Dusky Woodswallow	-	-	-
Eastern Rosella	-	X	-
Emu	-	-	X
Fantail Cuckoo	-	X	-
Galah	X	-	-
Golden Whistler	-	-	-
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	X
Jacky Winter	-	-	-
Laughing Kookaburra	-	X	X
Leaden Flycatcher	-	-	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	X	-	-
Noisy Friarbird	-	-	X
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Pacific Black Duck	X	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	X
Royal Spoonbill	-	X	-
Rufous Whistler	X	X	X
Sacred Ibis	-	X	-
Sacred Kingfisher	X	X	X
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	X
Silvereye	-	-	-
Spotted Pardalote	-	-	X
Straw-necked Ibis	-	X	-

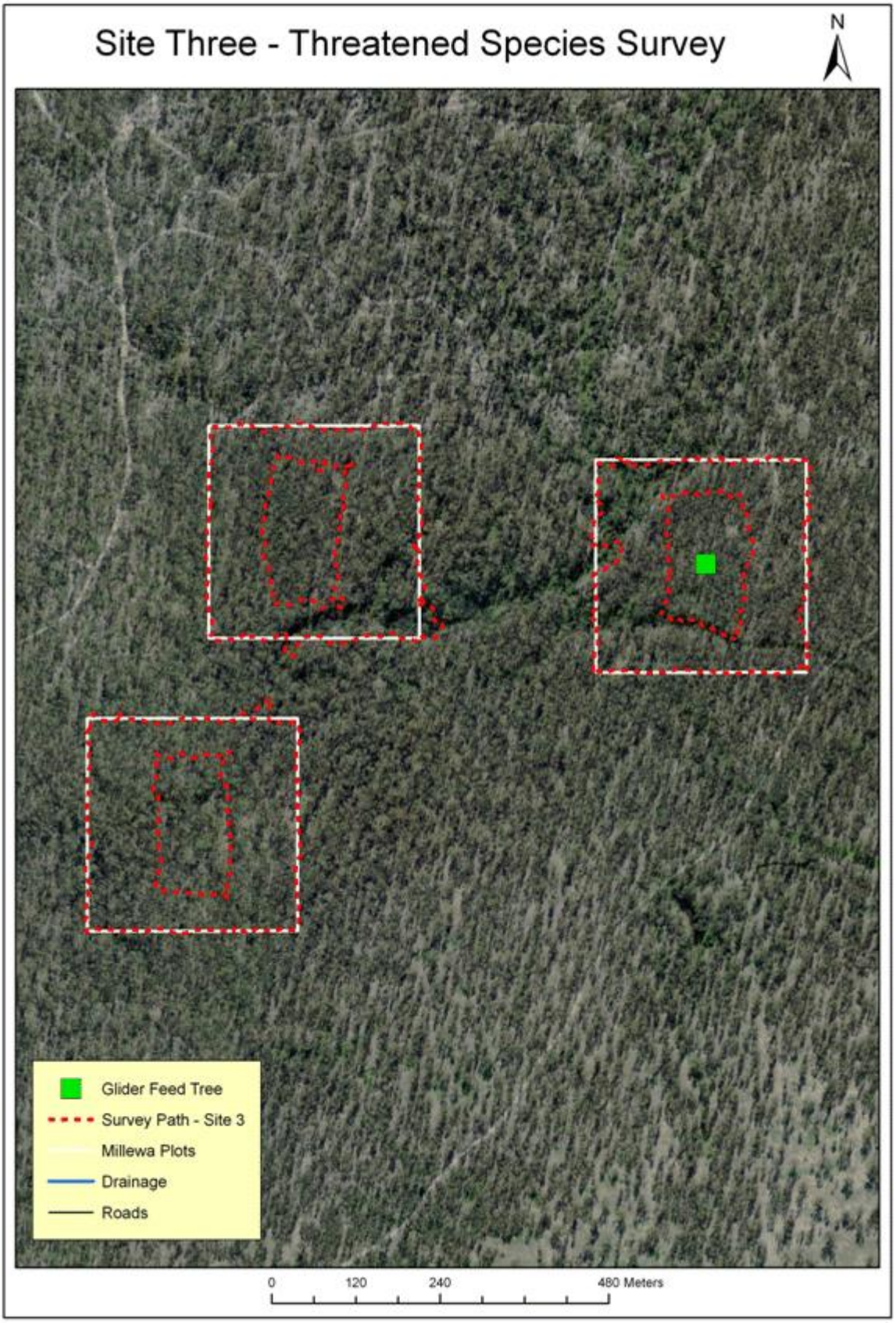
Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Striated Pardalote	-	X	X
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	-
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	-	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	X	-	-
White-faced Heron	-	X	-
White-necked Heron	X	X	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	X
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	X	-	X

Superb Parrot Assessment

Based on observations made while conducting other fauna work in the vicinity of site 3 it was determined that additional survey work was required to determine whether Superb Parrots were nesting on site 3. Three people spent 5 person hours searching this on the 29/11/12. No Superb Parrots were observed within site 3 during the survey period and it appears that Superb Parrots do not nest on this site.

A single Square-tailed Kite was flying in southerly direction over the eastern edge of plot 3/2. This bird was well above the forest canopy and was not considered to be utilising the habitat within the plot or hunting. The observation was made at the following location: GDA94 – 55: 317661E/6037728N.

Figure 3 Plot route and features survey



Site Number 4

Date surveyed 10 January 2013

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	29	36	31
Hollow bearing trees >1m	17	32	30
Stags (>1m) or <1m with hollows	33	35	33
Total hollows	**79**	**103**	**94**
Glider Feed trees	-	-	-
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Species	Count No. 1 5/6/12	Count No. 2 6/6/12	Count No. 3 10/1/13
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

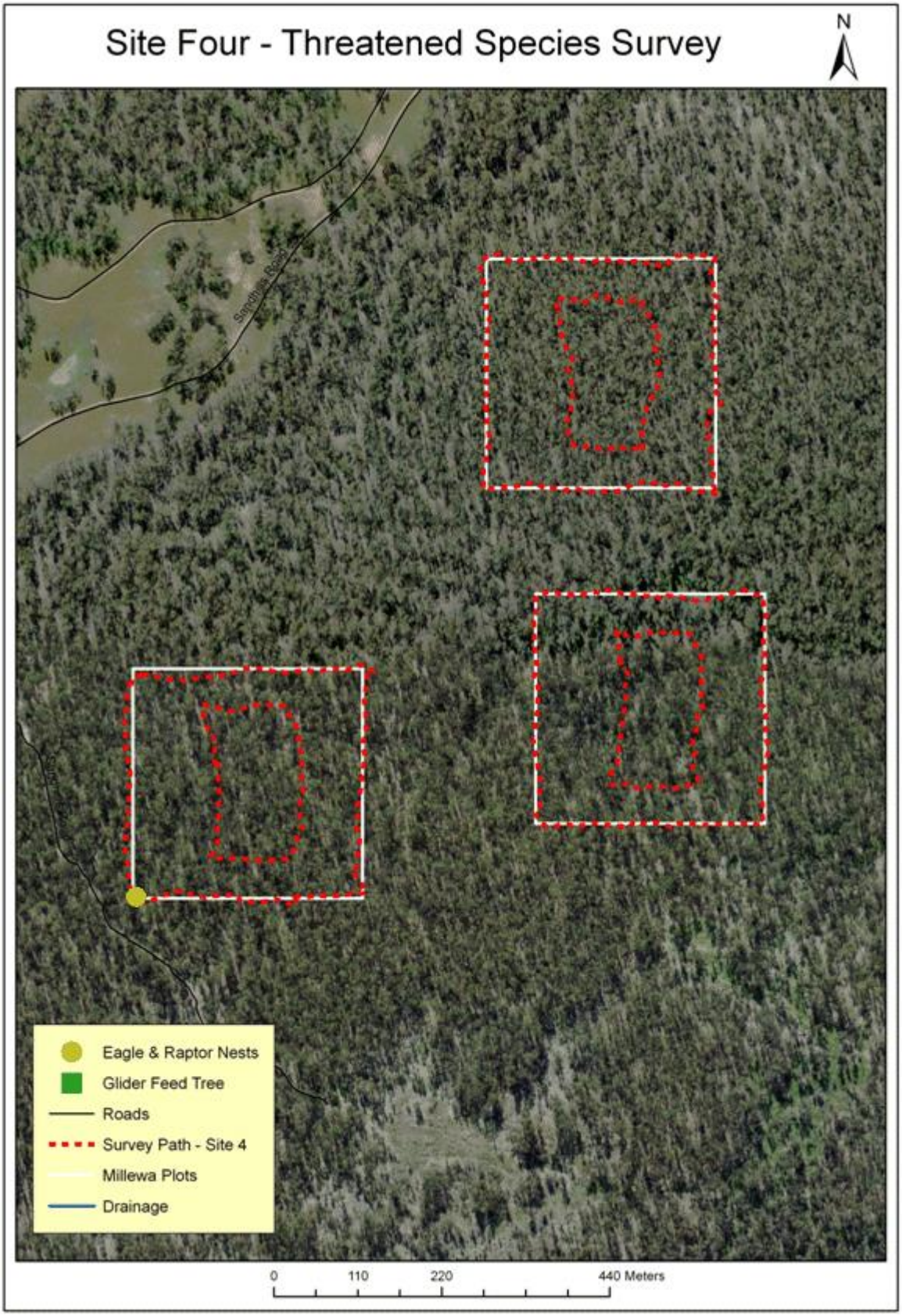
Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	-
Australian Raven	X	-	-
Black-faced Cuckoo-shrike	X	X	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	X	-
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	-	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	X
Galah	X	X	X
Golden Whistler	-	-	-
Grey Fantail	X	X	X
Grey Shrike-thrush	-	X	X
Jacky Winter	-	-	-
Laughing Kookaburra	X	-	X
Leaden Flycatcher	-	-	-
Little Friarbird	-	X	X
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	X	X	X
Noisy Friarbird	X	X	X
Noisy Miner	-	-	-
Olive-backed Oriole	X	-	-
Owlet Nightjar	-	-	-
Pacific Black Duck	-	-	-
Peaceful Dove	X	-	-
Pied Currawong	-	-	-
Rainbow Bee-eater	X	X	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	X	-	-
Royal Spoonbill	-	-	-
Rufous Whistler	X	X	X
Sacred Ibis	-	-	-
Sacred Kingfisher	X	-	X
Scarlet Robin	X	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	X	X	-
Spotted Pardalote	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Straw-necked Ibis	-	-	-
Striated Pardalote	X	-	X
Striated Thornbill	X	X	X
Sulphur-crested Cockatoo	X	-	X
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-breasted Woodswallow	-	X	-
White-browed Babbler	-	-	-
White-browed Woodswallow	X	-	-
White-browed Scrubwren	-	-	-
White-faced Heron	-	-	-
White-necked Heron	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	X	X	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	-	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 4 Plot route and features survey



Site Number 5

Date surveyed 9 January 2013

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	15	17	33
Hollow bearing trees >1m	14	5	16
Stags (>1m) or <1m with hollows	23	26	33
Total hollows	**52**	**48**	**82**
Glider Feed trees	-	-	1
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Species	Count No. 1 11/1/13	Count No. 2 12/1/13	Count No. 3 13/1/13
Barn Owl	-	-	-
Boobook Owl	X(2)	X(2)	X(2)
Common Brush-tail Possum	X(1)	X(2)	X(1)
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-
Owlet Nightjar	-	X(1)	-

Day surveys

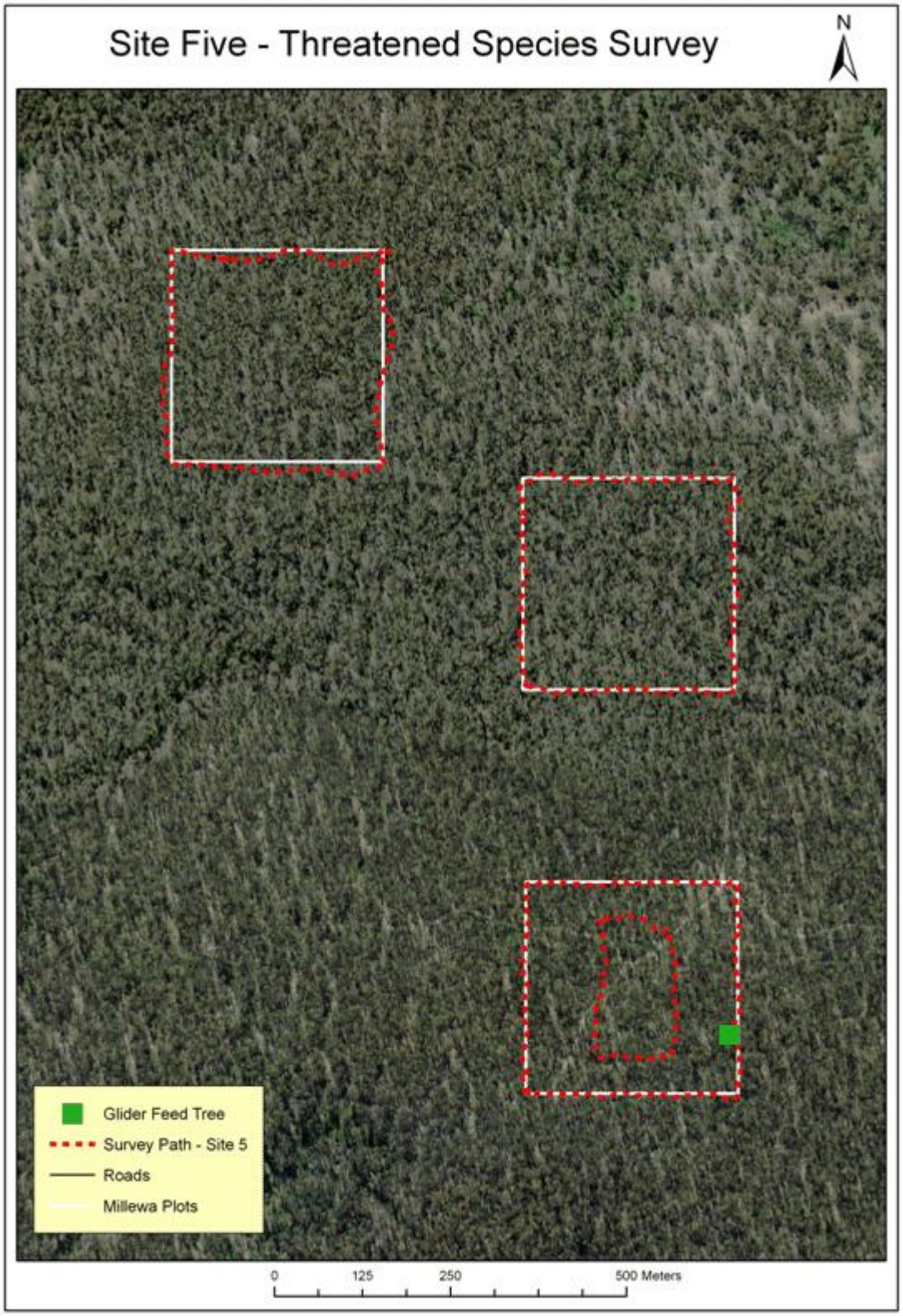
Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	-
Australian Raven	-	-	-
Black-faced Cuckoo-shrike	-	-	X
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	-	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Dusky Woodswallow	-	-	-
Eastern Rosella	-	X	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	-	X	-
Golden Whistler	-	-	-
Grey Fantail	X	-	-
Grey Shrike-thrush	X	X	-
Jacky Winter	-	-	-
Laughing Kookaburra	-	-	-
Leaden Flycatcher	-	-	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	X	-	-
Noisy Friarbird	-	X	-
Noisy Miner	-	-	-
Olive-backed Oriole	-	-	-
Owlet Nightjar	-	-	-
Pacific Black Duck	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Rainbow Bee-eater	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-
Royal Spoonbill	-	-	-
Rufous Whistler	X	X	X
Sacred Ibis	-	-	-
Sacred Kingfisher	X	-	-
Scarlet Robin	X	X	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	X*	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Spotted Pardalote	-	-	-
Straw-necked Ibis	-	-	-
Striated Pardalote	-	X	-
Striated Thornbill	-	X	X
Sulphur-crested Cockatoo	X	X	-
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	X
Wedge-tail Eagle	-	-	-
Weebill	-	-	X
Welcome Swallow	-	-	-
White-breasted Woodswallow	-	-	-
White-browed Babbler	-	-	-
White-browed Woodswallow	-	-	-
White-browed Scrubwren	X	-	-
White-faced Heron	-	-	-
White-necked Heron	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	-	-
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	X	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

* Adult feeding young

Figure 5 Plot route and features survey



Site Number 6

Date surveyed 23-24 May 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	13	17	27
Hollow bearing trees >1m	5	8	15
Stags (>1m) or <1m with hollows	63	50	52
Total hollows	**81**	**75**	**94**
Glider Feed trees	-	-	-
Raptor or waterbird nests	-	-	-

Comments

Relatively few LHB trees and small regrowth common

Spotlight and call playback surveys

Species	Count No. 1 23/5/12	Count No. 2 5/6/12	Count No. 3 6/6/12
Barn Owl	X	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	X	X	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	X	-	-
Tawny Frogmouth	-	-	-

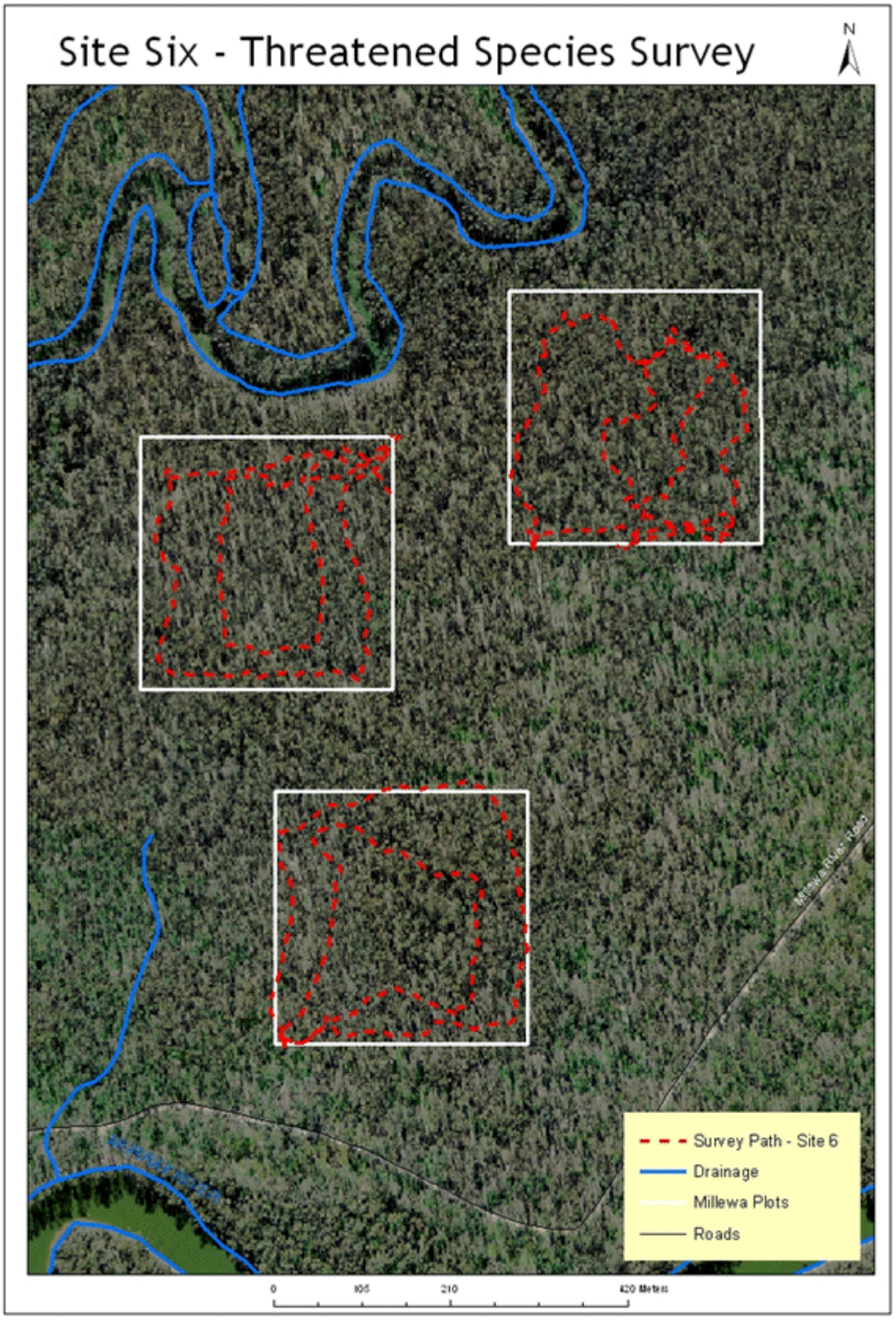
Day Surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	-
Barn Owl	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Boobook Owl	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Dusky Woodswallow	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Eastern Rosella	-	-	-
Galah	-	-	X
Golden Whistler	-	X	-
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	-
Laughing Kookaburra	X	-	-
Little Raven	X	X	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	-	-
Scarlet Robin	X (2)	X(2)	X(4)
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	X
Striated Thornbill	X	X	X
Sulphur-crested Cockatoo	-	X	X
Superb Blue-wren	X	X	X
Weebill	-	X	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow Thornbill	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Eastern Grey Kangaroo	-	X	-
Sugar Glider	-	-	-
Yellow-footed Antechinus	X	-	-

Figure 6 Plot route and features survey



Site Number 7

Table 1 Habitat variables

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m	9	26	11
Hollow bearing trees >1m	3	1	2
Stags (>1m)	19	12	10
Total No. of Hollows	**31**	**39**	**23**
Glider Feed trees	2	4	-
Nests & Bats	-	1	-

Comments

Large trees uncommon across all plots

Plot 7-2 had a large number of hollow trees < 1m.

Spotlight and call playback surveys

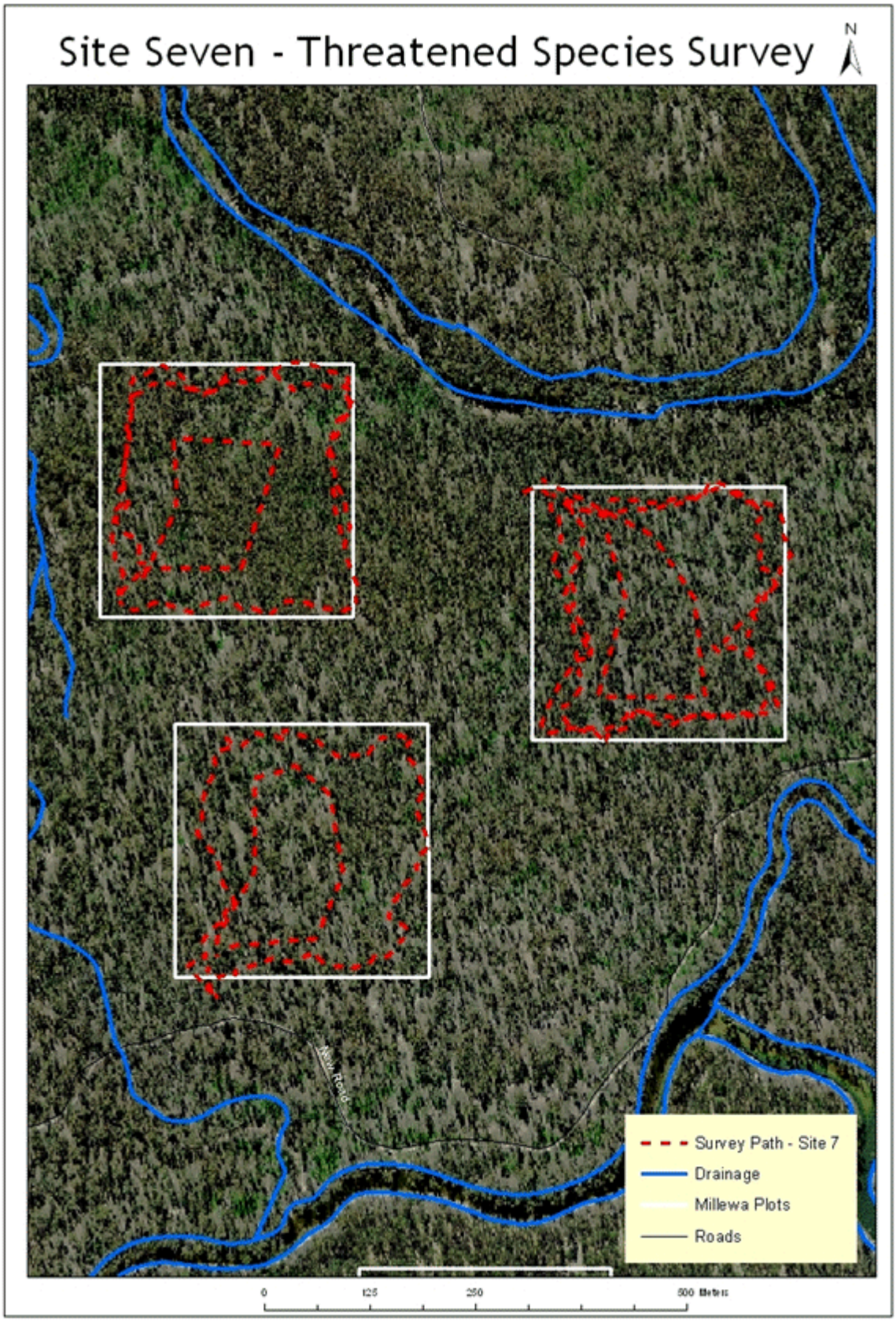
Species	Count No. 1 21/5/12	Count No. 2 22/5/12	Count No. 3 23/5/12
Barn Owl	-	-	X
Boobook Owl	-	-	-
Common Brush-tail Possum	X	X	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	X	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day Surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Golden Whistler	x	x	-
Rufous Whistler	x	-	-
Grey Fantail	x	x	x
Little Raven	-	-	-
Weebill	x	-	x
Buff-rumped Thornbill	x	x	x
Yellow Thornbill	-	x	-
Spotted Pardalote	-	x	x
Striated Thornbill	x	x	x

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Grey Shrike-thrush	x	x	x
Galah	-	-	x
Yellow Rosella	x	x	x
Eastern Rosella	-	-	-
Sulphur-crested Cockatoo	-	x	x
Laughing Kookaburra	x	x	x
White-throated Treecreeper	-	x	x
Brown Tree-creeper	x	-	-
Superb Fairy-wren	x	x	x
White-plumed Honeyeater	-	-	-
Australian Magpie	-	-	x
Crested Pigeon	-	-	-
Peaceful Dove	-	-	-
Noisy Friarbird	-	x	-
Pied Currawong	-	-	-
Scarlet Robin	**x**	**-**	**x**
Red-capped Robin	-	-	-
Wood Duck	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Boobook Owl	-	x	-
Barn Owl	-	-	x
Owlet Nightjar	-	-	-
Australian Raven	x	-	x
Striated Pardalote	-	x	x
White-winged Chough	x	-	x
Willie Wagtail	-	-	x
Brown-headed Honeyeater	-	-	x
Pacific Black Duck	-	-	x
Red-rumped Parrot	-	x	-
Eastern Grey Kangaroo	-	x	-
Yellow-footed Antechinus	-	-	-
Fox	-	-	x
Fallow Deer	x	-	-

Figure 7 Plot route and features survey



Site Number 8

Date surveyed 23 May 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	9	20	9
Hollow bearing trees >1m	-	2	3
Stags (>1m) or <1m with hollows	28	11	19
Total hollows	**37**	**33**	**31**
Glider Feed trees	1	4	2
Raptor or waterbird nests	-	-	-

Comments

8-1 No large living trees and Mistletoe common in parts

8-2 Glider feed trees mostly in small trees <40cm dbh

8-3 Tree hollow excavations (Parrots) to form hollows in relatively small trees common

Spotlight and call playback surveys

Species	Count No. 1 21/5/12	Count No. 2 22/5/12	Count No. 3 23/5/12
Barn Owl	X	X	X
Boobook Owl	X	X	X
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	X
Tawny Frogmouth	-	-	X

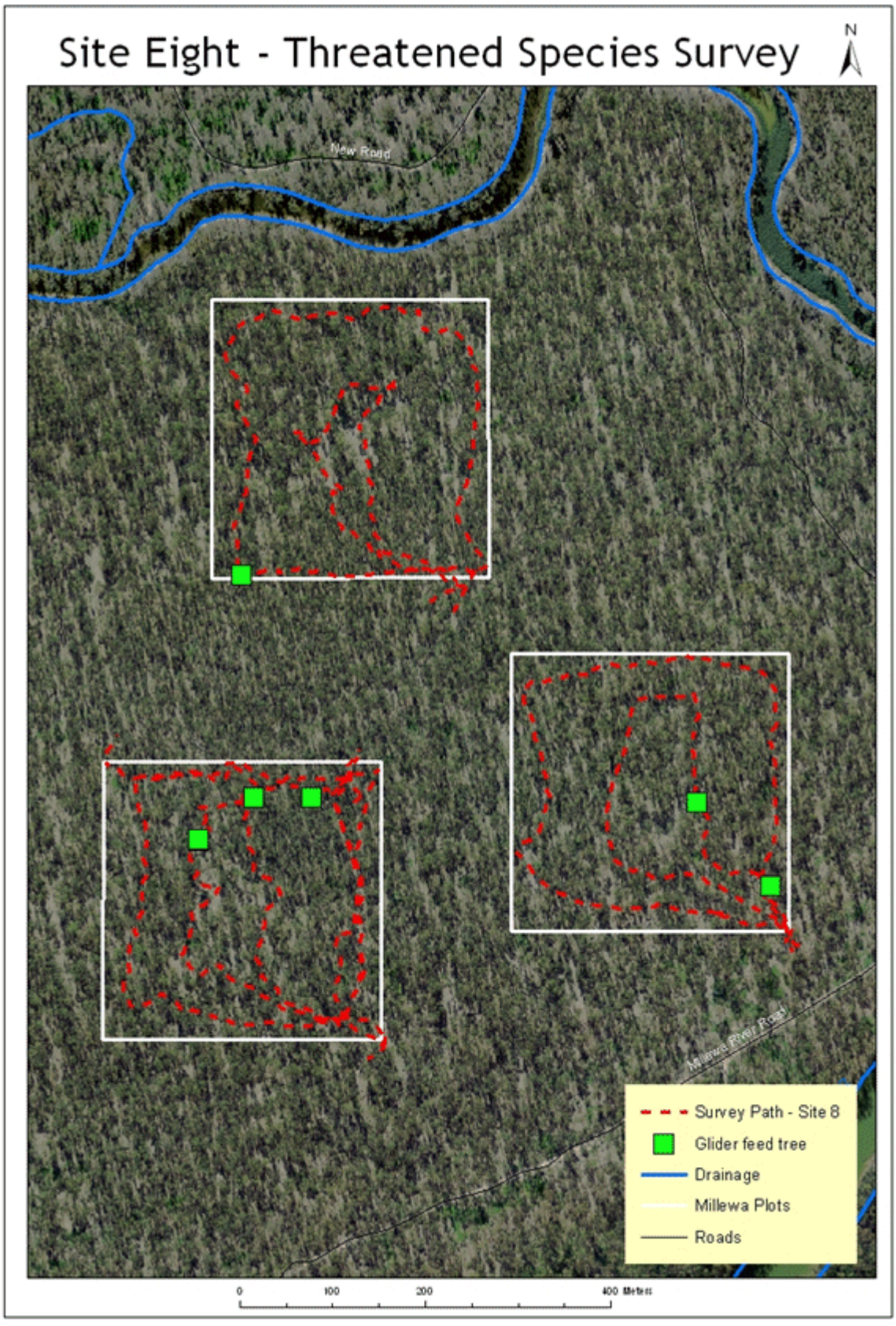
Day Surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	X
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	X
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Galah	-	-	-
Golden Whistler	X	X	X
Grey Fantail	X	-	X
Grey Shrike-thrush	X	X	-
Laughing Kookaburra	X	X	-
Little Raven	X	-	X
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	X	-
Scarlet Robin	**-**	**X (4)**	**X**
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	-
Striated Thornbill	X	X	-
Sulphur-crested Cockatoo	-	-	-
Superb Blue-wren	-	X	X
Weebill	X	X	-
Welcome Swallow	X	-	X
White-browed Babbler	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	-	-	-
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Yellow Thornbill	X	X	-
Eastern Grey Kangaroo	X	X	-
Common Brushtail Possum	-	-	-
Sugar Glider	-	-	-
Yellow-footed Antechinus	-	-	-
Shining Bronze-Cuckoo	-	-	-
Fantail Cuckoo	-	-	-
Mistletoe Bird	-	-	-
Brown-headed Honeyeater	-	-	-
Varied Sittella	**-**	**-**	**-**
Jacky Winter	-	-	-
Wedge-tail Eagle	X	-	-

Figure 8 Plot route and features survey



Site Number 9

Date surveyed 22 April 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	23	14	5
Hollow bearing trees >1m	10	15	9
Stags (>1m) or <1m with hollows	34	8	9
Total hollows	**67**	**37**	**23**
Glider Feed trees	1	-	5
Raptor or waterbird nests	-	-	-

Comments

Site 9-1

Live and dead large hollow-bearing trees were common throughout

Site 9-2

Live and dead large hollow-bearing trees were unevenly spread across site and many trees near hollow formation

Site 9-3

Hollow bearing trees <1 m sparse with scattered large trees along drainages.

Notes:

Fish were common in pools and runners at this site

Glider feed trees were common in 9-3 and were all marked with green “F”

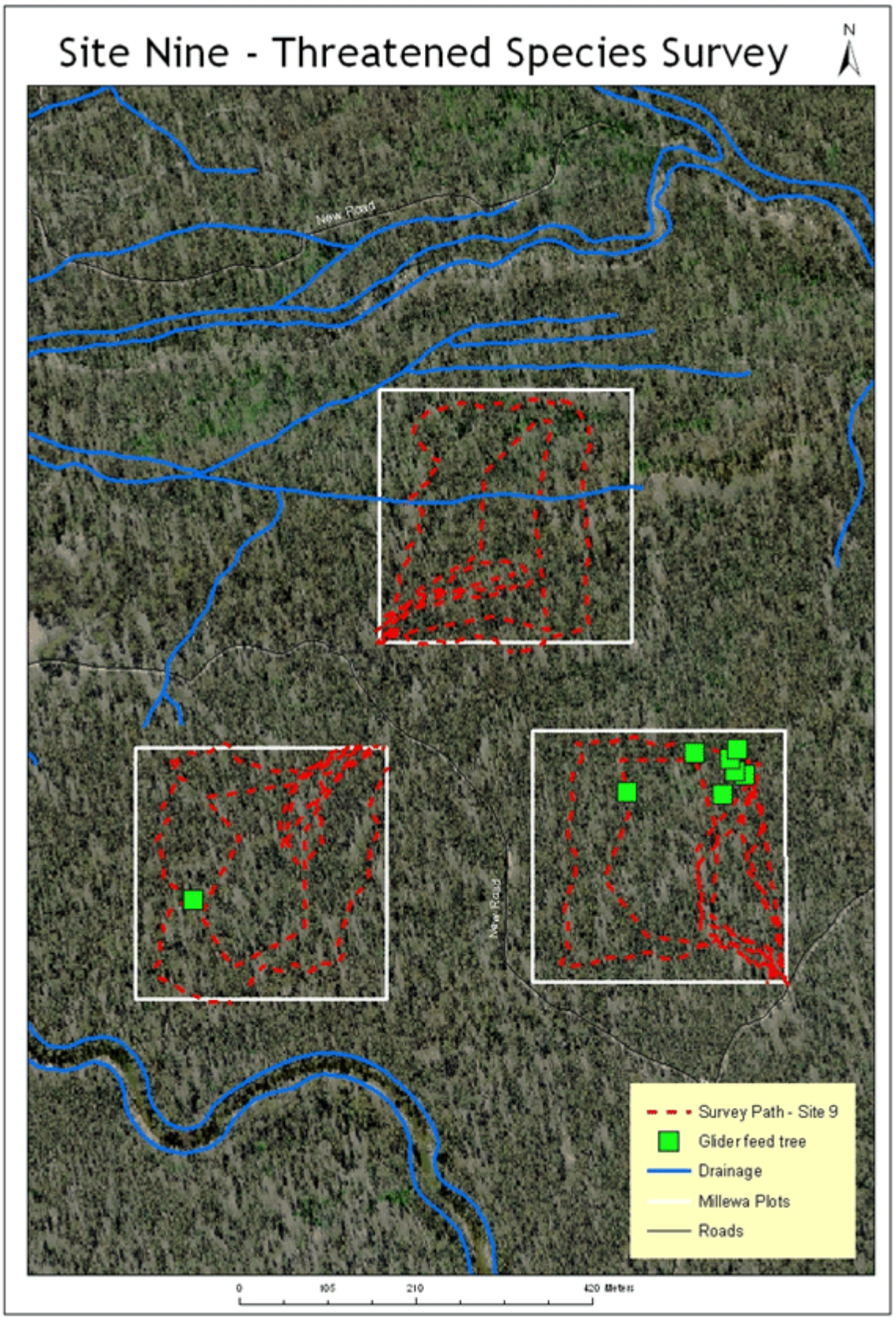
Spotlight and call playback surveys

Species	Count No. 1 21/4/12	Count No. 2 22/4/12	Count No. 3 20/12/12
Barn Owl	-	-	X
Boobook Owl	X	-	-
Common Brush-tail Possum	-	X	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	X	X	X
Tawny Frogmouth	-	-	-

Table 2 Day survey Species List

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	X	X
Black-faced Cuckoo-shrike	-	X	-
Boobook Owl	X	-	-
Brown Tree-creeper	X	X	-
Buff-rumped Thornbill	X	X	X
Galah	X	-	-
Golden Whistler	-	X	-
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	-
Laughing Kookaburra	-	-	X
Little Raven	-	X	X
Red-browed Finch	-	X	-
Red-capped Robin	X	-	-
Red-rumped Parrot	X	-	-
Rufous Whistler	X	-	-
Scarlet Robin	X	-	-
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	-
Striated Thornbill	X	X	X
Superb Blue-wren	X	X	X
Varied Sittella	**X**	**X**	**-**
Weebill	X	X	X
White-plumed Honeyeater	X	X	-
White-throated Treecreeper	X	X	X
Willie Wagtail	x	x	x
Yellow Rosella	X	X	X
Yellow Thornbill	-	X	X
Yellow-rumped Thornbill	X	-	X
Eastern Grey Kangaroo	-	-	X
Sugar Glider	-	-	-

Figure 9 Plot route and features survey



Site Number 10

Date surveyed 20 April 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	21	19	12
Hollow bearing trees >1m	2	4	1
Stags (>1m) or <1m with hollows	12	17	5
Total hollows	**35**	**40**	**18**
Glider Feed trees	1	-	-
Raptor or waterbird nests	-	-	-

Comments

Site 9-1

Live and dead large hollow-bearing trees were scattered across the plot

Site 9-2

Live and dead large hollow-bearing trees were scattered across the plot

Site 9-3

Live and dead large hollow-bearing trees were sparsely scattered throughout the plot

Notes:

Spotlight and call playback surveys

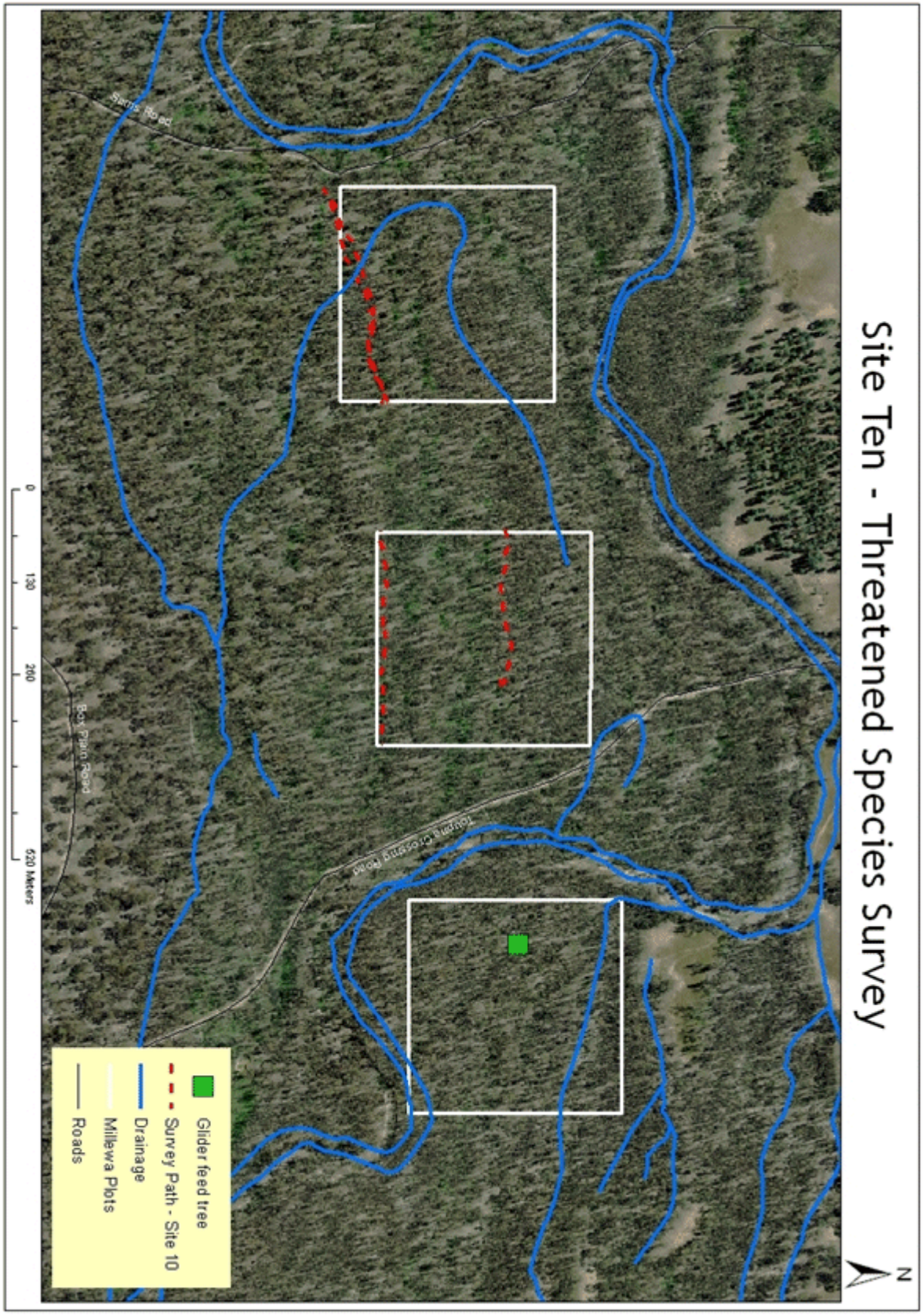
Species	Count No. 1 20/4/12	Count No. 2 21/4/12	Count No. 3 22/4/12
Barn Owl	X	-	X
Boobook Owl	X	X	X
Common Brush-tail Possum	X	X	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	X
Tawny Frogmouth	-	-	-

Table 2 Day survey Species List

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	X	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Black-faced Cuckoo-shrike	X	-	-
Buff-rumped Thornbill	-	X	X
Crested Pigeon	-	X	-
Galah	-	X	-
Golden Whistler	-	X	-
Grey Fantail	X	X	X
Grey Shrike-thrush	-	X	X
Laughing Kookaburra	-	X	X
Little Raven	X	X	X
Noisy Friarbird	X	-	-
Owlet Nightjar	X	-	X
Pied Currawong	X	-	-
Scarlet Robin	-	-	X
Spotted Pardalote	-	x	x
Striated Pardalote	X	X	-
Striated Thornbill	X	-	X
Sulphur-crested Cockatoo	-	-	X
Superb Blue-wren	X	-	X
Weebill	-	X	X
White-plumed Honeyeater	-	-	X
White-throated Treecreeper	X	X	X
Wood Duck	X	X	-
Yellow Rosella	X	X	-
Yellow Thornbill	-	X	-
Eastern Grey Kangaroo	-	-	X

Figure 10 Plot route and features survey



Site Number 11

Date surveyed 2 May 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	37	29	34
Hollow bearing trees >1m	6	7	30
Stags (>1m) or <1m with hollows	27	10	25
Total hollows	**70**	**46**	**89**
Glider Feed trees	-	2	-
Raptor or waterbird nests	-	-	-

Comments

Numerous hollow excavations apparent (presumably by Parrots e.g. Galahs, SC Cockatoos etc), especially at site 11-3

Spotlight and call playback surveys

Species	Count No. 1 20/4/12	Count No. 2 21/4/12	Count No. 3 22/4/12
Barn Owl	X	X	X
Boobook Owl	-	-	-
Common Brush-tail Possum	X	X	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	X	-
White-striped Mastiff Bat	X	-	-
Tawny Frogmouth	-	-	-

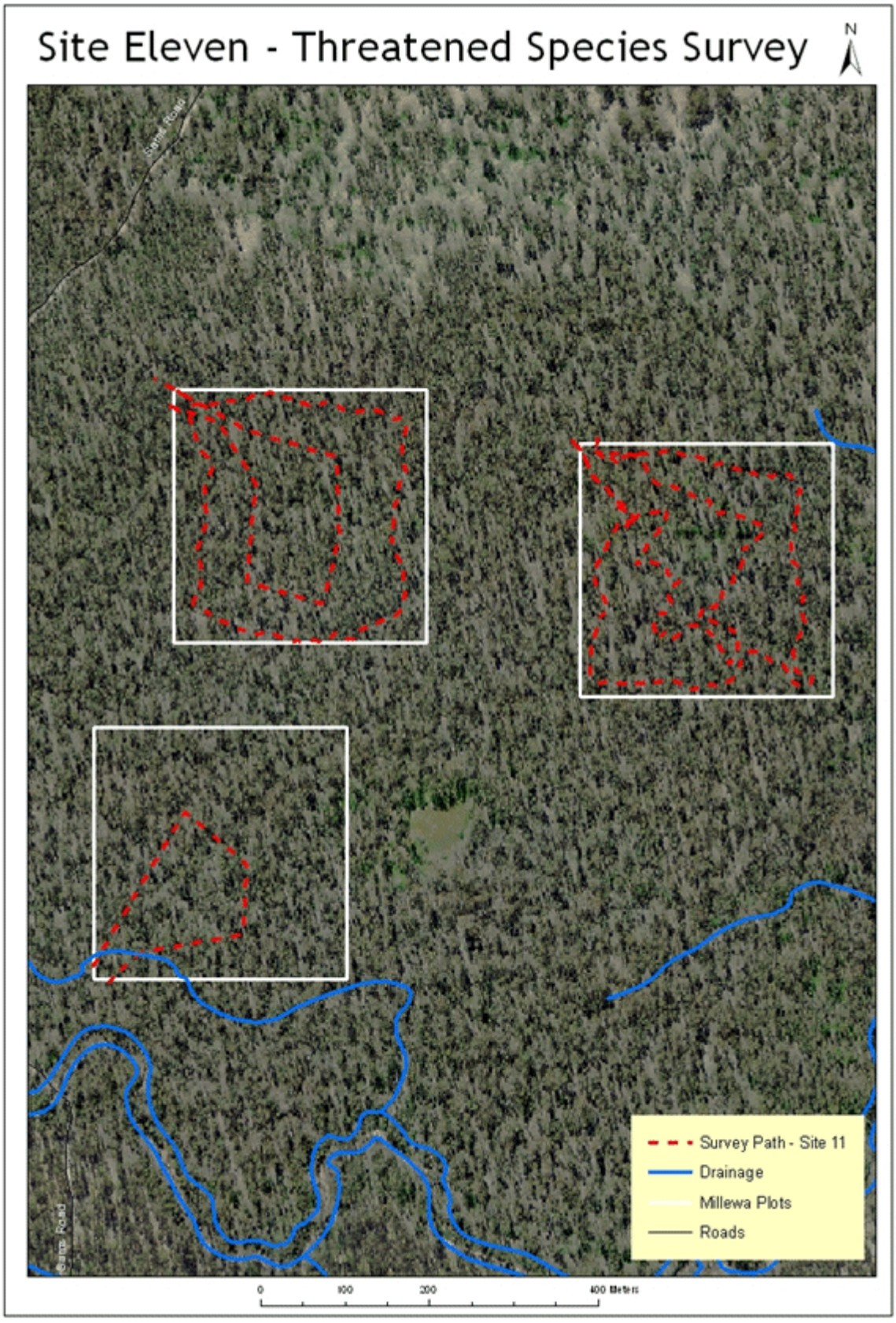
Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	X	-	-
Black-faced Cuckoo-shrike	X	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	X	X
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Galah	X	X	X
Golden Whistler	-	X	X
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	X
Laughing Kookaburra	X	-	-
Little Raven	X	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	X	-	X
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	-	-
Scarlet Robin	-	X	-
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	-
Striated Thornbill	-	X	X
Sulphur-crested Cockatoo	X	-	-
Superb Blue-wren	X	X	X
Weebill	-	-	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	X	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow Thornbill	-	X	-
Eastern Grey Kangaroo	X	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Sugar Glider	-	-	-
Yellow-footed Antechinus	X	-	-
Little Friarbird	-	-	-
Tree Martin	-	-	-
Mistletoe Bird	-	-	-
Crested Shrike-tit	-	-	-
Varied Sittella	-	-	-
Jacky Winter	-	-	-
Brown-headed Honeyeater	-	X	-

Figure 11 Plot route and features survey



Site Number 12

Date surveyed 22 May 2012

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	26	9	12
Hollow bearing trees >1m	4	2	6
Stags (>1m) or <1m with hollows	16	20	15
Total hollows	**46**	**31**	**33**
Glider Feed trees	2	2	1
Raptor or waterbird nests	-	-	-

Comments

Several recently dead LHB trees possibly from drought stress

Ringtail Possum and Sugar Glider recorded on Box Plain Ridge

Spotlight and call playback surveys

Species	Count No. 1 21/5/12	Count No. 2 22/5/12	Count No. 3 23/5/12
Barn Owl	-	-	-
Boobook Owl	X	X	X
Common Brush-tail Possum	X	X	X
Common Ringtail Possum	-	-	X
Sugar Glider	-	X	X (heard)
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

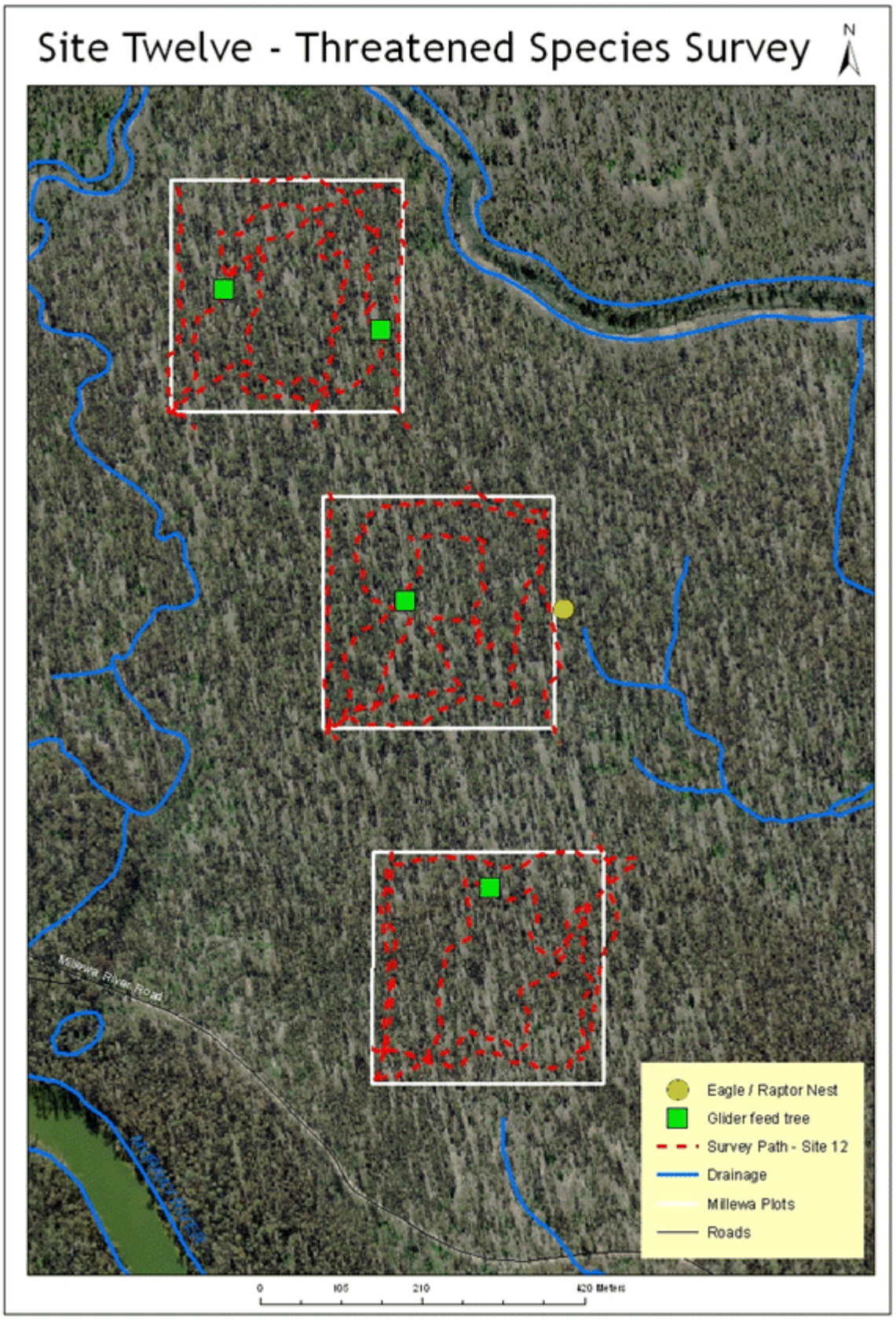
Day Surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	X	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	-	X
Buff-rumped Thornbill	-	X	-
Crested Pigeon	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Galah	-	-	-
Golden Whistler	-	-	-
Grey Fantail	-	X	X
Grey Shrike-thrush	X	-	-
Laughing Kookaburra	X	-	X
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	X	-	-
Scarlet Robin	X	X	-
Spotted Pardalote	X	X	X
Striated Pardalote	X	X	X
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	-	X	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	-
Yellow Thornbill	X	X	X
Eastern Grey Kangaroo	-	X	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Yellow-footed Antechinus	-	-	X
Emu	-	X	-
Yellow-rumped Thornbill	-	X	-
Jacky Winter	X	X	-
Varied Sittella	-	X	-
Fantail Cuckoo	-	-	-
Shining Bronze-Cuckoo	X	-	-
Mistletoe Bird	X	-	-
Red Wattlebird	-	-	X

Figure 12 Plot route and features survey



Site Number 13

Date(s) surveyed 4 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	32	16	11
Hollow bearing trees >1m	14	20	12
Stags (>1m) or <1m with hollows	25	30	18
Total hollows	**71**	**66**	**41**
Glider Feed trees	11	5	1
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

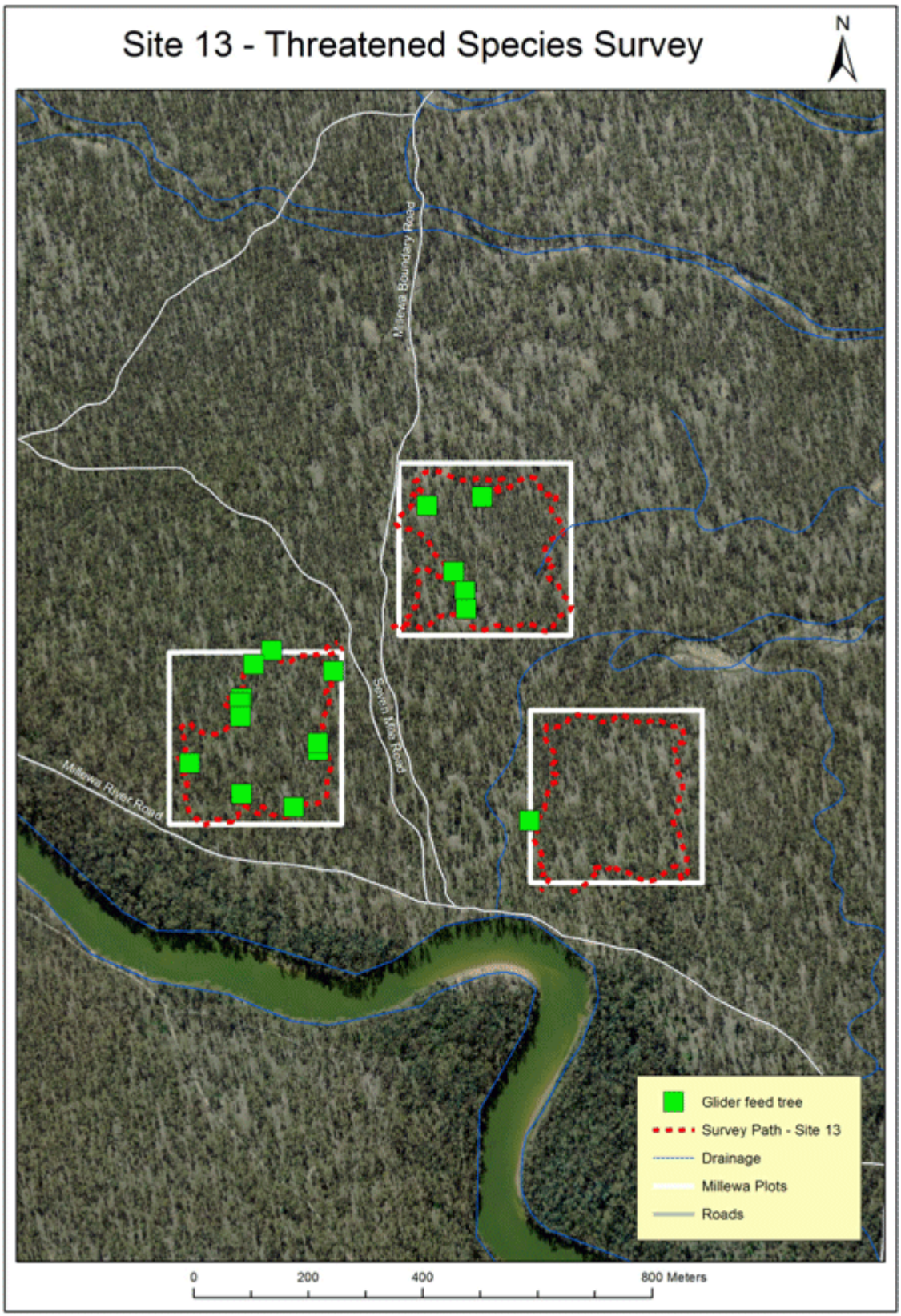
Species	Site No. FO36Mi	Site No. FO37Mi	Site No. FO41Mi
—	**Date: 10/6/15**	**Date: 10/6/15**	**Date: 10/6/15**
—	**Distance from site 13: 2.6km**	**Distance from site 13: 0.2km**	**Distance from site 13:2.8km**
Barking Owl	-	-	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	X
Australian Raven	X	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	-	-	X
Golden Whistler	-	-	X
Grey Fantail	X	-	-
Grey Shrike-thrush	X	X	X
Jacky Winter	X	X	-
Laughing Kookaburra	-	-	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	X	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	X	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	X	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	-	-	-
White-winged Chough	X	X	X
Willie Wagtail	X	-	-
Wood Duck	-	-	-
Yellow Rosella	-	-	-
Yellow-rumped Thornbill	-	X	-
Yellow Thornbill	X	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 13 Plot route and features survey



Site Number 14

Date(s) surveyed 4 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	60	59	32
Hollow bearing trees >1m	36	50	10
Stags (>1m) or <1m with hollows	10	13	12
Total hollows	**106**	**122**	**54**
Glider Feed trees	2	4	4
Raptor or waterbird nests	1	-	-

Comments

North west boundary of 14-1 has Grey Box.

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

Species	Site No. FO36Mi	Site No. FO37Mi	Site No. FO42Mi
—	**Date: 10/6/15**	**Date: 10/6/15**	**Date: 11/6/15**
—	**Distance from site 14: 1.4km**	**Distance from site 14: 1.1km**	**Distance from site 14:2.1km**
Barking Owl	-	-	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-

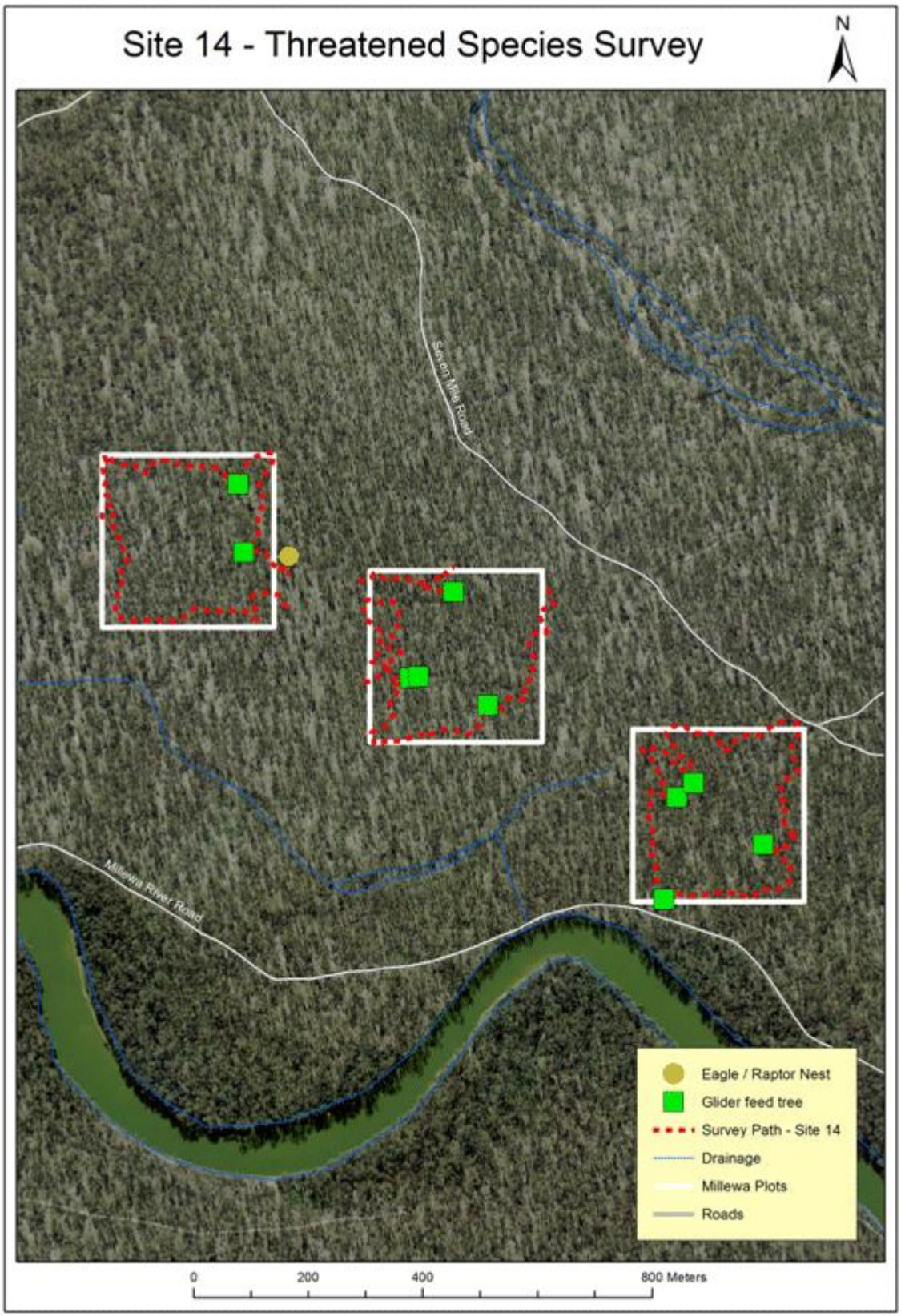
Species	Site No. FO36Mi	Site No. FO37Mi	Site No. FO42Mi
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	X
Australian Raven	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	-
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	-	X	X
Golden Whistler	X	-	X
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	-
Jacky Winter	-	-	-
Laughing Kookaburra	-	X	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	X	X	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	-	-
Scarlet Robin	X	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	-	-	X
Tree Martin	-	-	-
Varied Sittella	-	-	X
Wedge-tail Eagle	-	-	-
Weebill	-	-	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	X
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	-	X
Yellow-rumped Thornbill	X	-	-
Yellow Thornbill	X	-	-
Little Eagle- flying over	-	-	X
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 14 Plot route and features survey



Site Number 15

Date(s) surveyed 6 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	61	47	22
Hollow bearing trees >1m	8	11	2
Stags (>1m) or <1m with hollows	29	26	19
Total hollows	**98**	**84**	**43**
Glider Feed trees	4	4	2
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

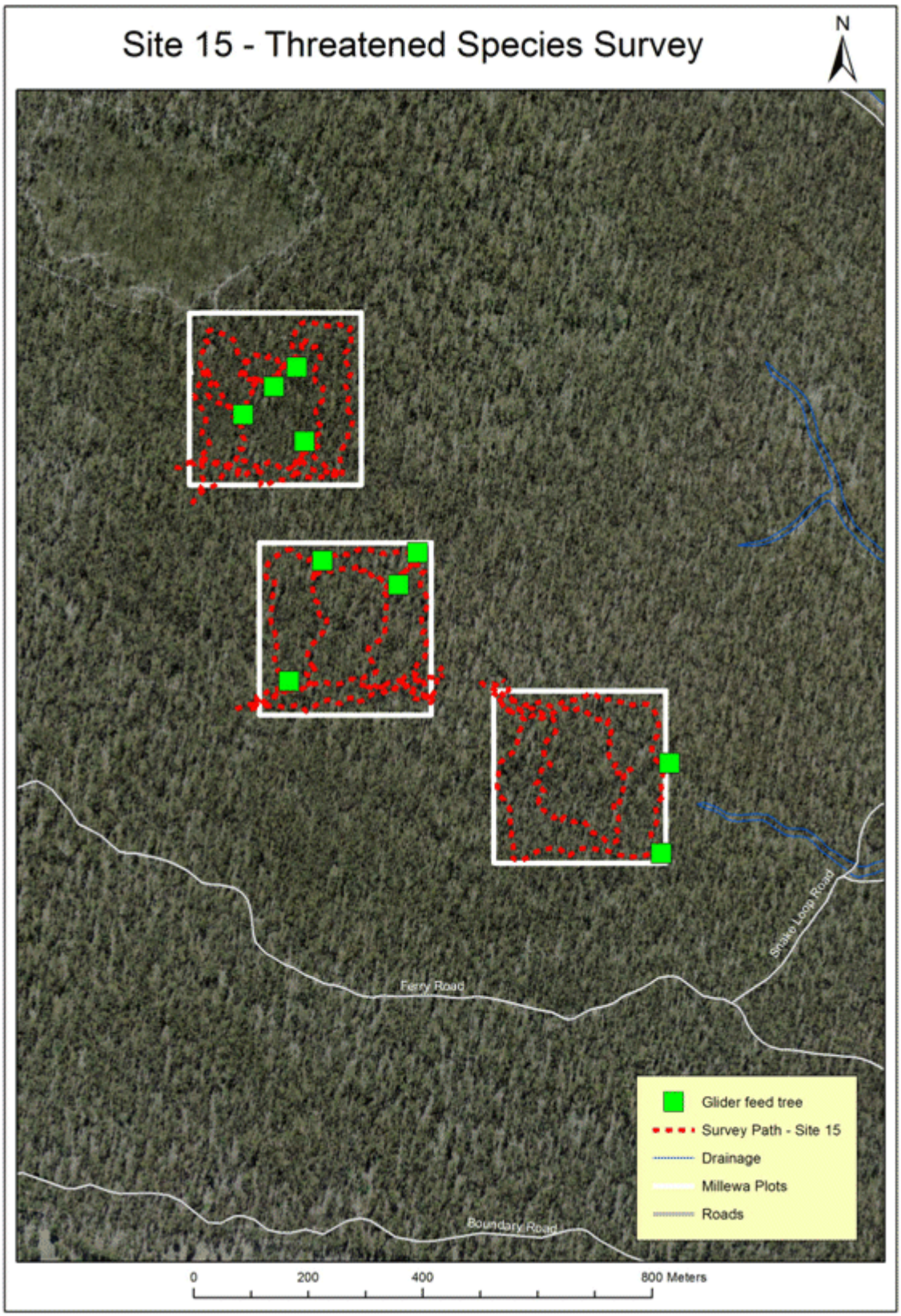
Species	Site No. FO60Mo	Site No. FO61Mo	Site No. FO62Mo
—	**Date: 13/6/2015**	**Date: 13/6/2015**	**Date: 13/6/2015**
—	**Distance from site 15: 3.5km**	**Distance from site 15: 1.2km**	**Distance from site 15: 1.2km**
Barking Owl	-	-	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	-
Australian Raven	-	-	X
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	-	-	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	X	X
Golden Whistler	X	-	-
Grey Fantail	-	-	X
Grey Shrike-thrush	-	-	X
Jacky Winter	X	-	-
Laughing Kookaburra	-	X	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	X	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	-	-	-
Tree Martin	-	-	-
Varied Sittella	-	-	X
Wedge-tail Eagle	-	-	-
Weebill	-	-	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	X	X	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	-	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 15 Plot route and features survey



Site Number 16

Date(s) surveyed 6 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	38	24	16
Hollow bearing trees >1m	8	16	6
Stags (>1m) or <1m with hollows	46	23	54
Total hollows	**92**	**73**	**76**
Glider Feed trees	5	2	1
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

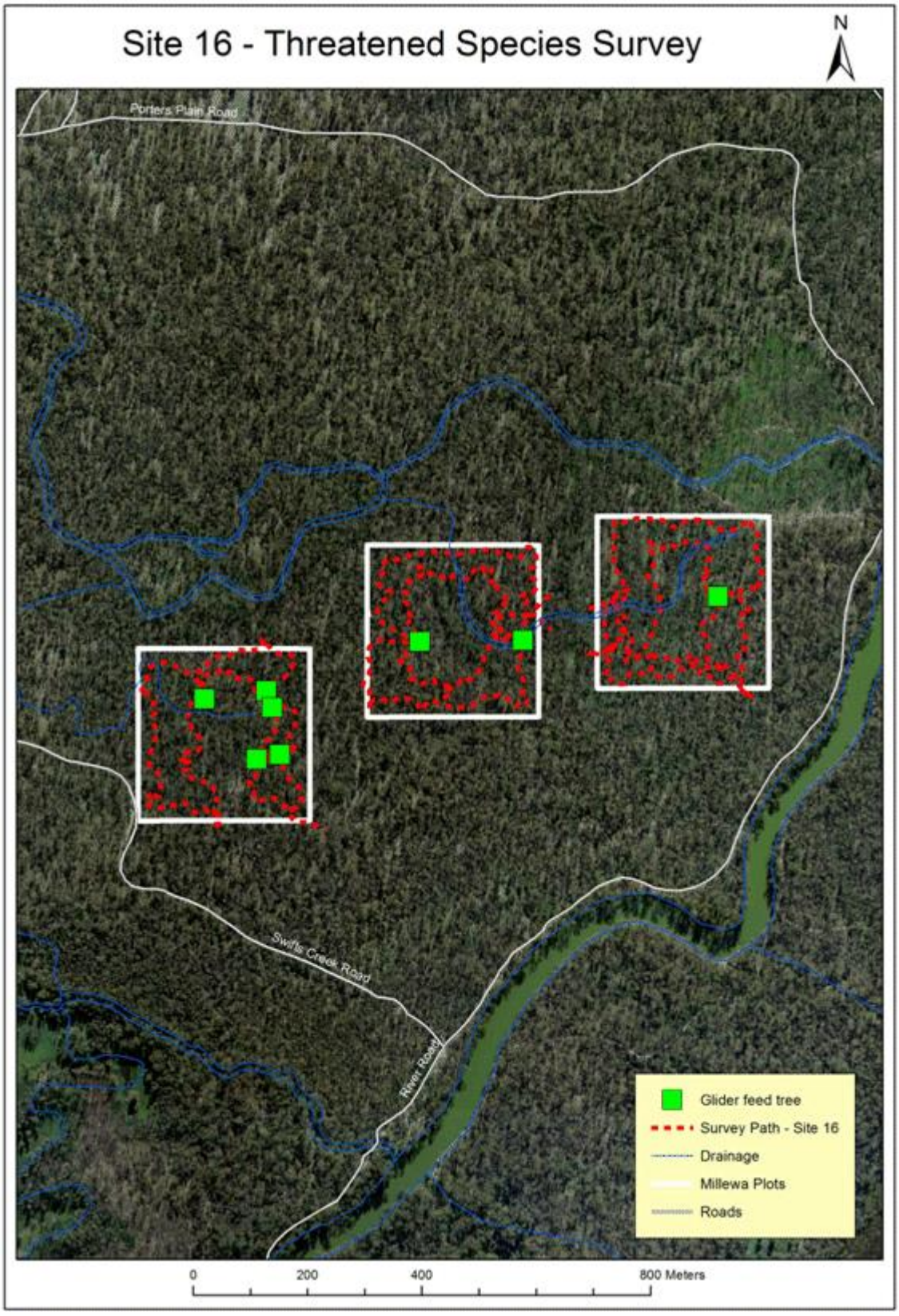
Species	Site No. FO52Mo	Site No. FO53Mo	Site No. FO54Mo
—	**Date: 14/6/15**	**Date: 13/6/15**	**Date: 14/6/15**
—	**Distance from site 16: 1.9km**	**Distance from site 16: 0.7km**	**Distance from site 16: 3.0km**
Barking Owl	-	-	X
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	X	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	-
Australian Raven	X	X	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	X	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	X	X
Golden Whistler	X	-	-
Grey Fantail	X	X	X
Grey Shrike-thrush	X	X	X
Jacky Winter	X	X	X
Laughing Kookaburra	-	-	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	X
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	X	X	X
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	-
Superb Blue-wren	-	X	X
Tree Martin	-	X	X
Varied Sittella	-	-	-
Wedge-tail Eagle	-	X Nesting	-
Weebill	-	X	-
Welcome Swallow	X	X	X
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	X	X
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	X	X
Yellow-rumped Thornbill	X	-	-
Yellow Thornbill	X	-	X
Flame Robin	-	X 10+	X 2+
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 16 Plot route and features survey



Site Number 17

Date(s) surveyed 6 and 8 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	20	10	14
Hollow bearing trees >1m	10	1	6
Stags (>1m) or <1m with hollows	40	31	54
Total hollows	**70**	**42**	**74**
Glider Feed trees	1	2	2
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

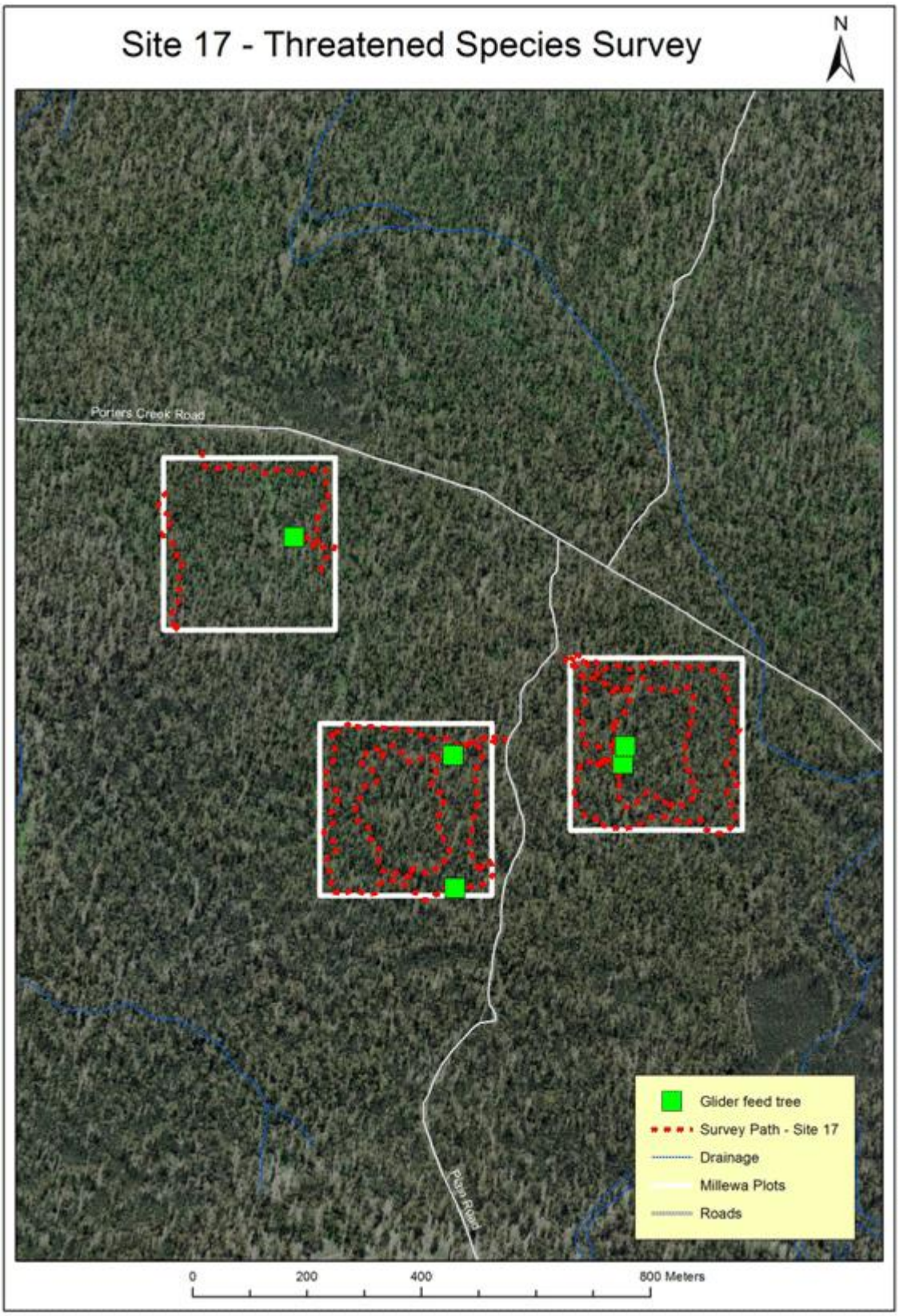
Species	Site No. FO52Mo	Site No. FO54Mo	Site No. FO55Mo
—	**Date: 14/6/15**	**Date: 14/6/15**	**Date: 14/6/15**
—	**Distance from site 17: 0.6km**	**Distance from site 17: 1.6km**	**Distance from site 17: 2.3km**
Barking Owl	-	X	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	X	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	X
Australian Raven	-	-	X
Black-faced Cuckoo-shrike	-	-	X
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	X	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	-	-
Golden Whistler	X	X	X
Grey Fantail	-	X	X
Grey Shrike-thrush	X	X	-
Jacky Winter	X	X	X
Laughing Kookaburra	X	-	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	X	-	-
Masked Owl	-	-	-
Mistletoe Bird	X	X	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	X
Red-capped Robin	-	X	X
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	X	X	X
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	X
Striated Thornbill	X	-	X
Sulphur-crested Cockatoo	X	-	X
Superb Blue-wren	X	-	-
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	-	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	X	X
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 17 Plot route and features survey



Site Number 18

Date(s) surveyed 8 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	10	12	18
Hollow bearing trees >1m	3	15	26
Stags (>1m) or <1m with hollows	30	31	54
Total hollows	**43**	**58**	**98**
Glider Feed trees	-	1	1
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

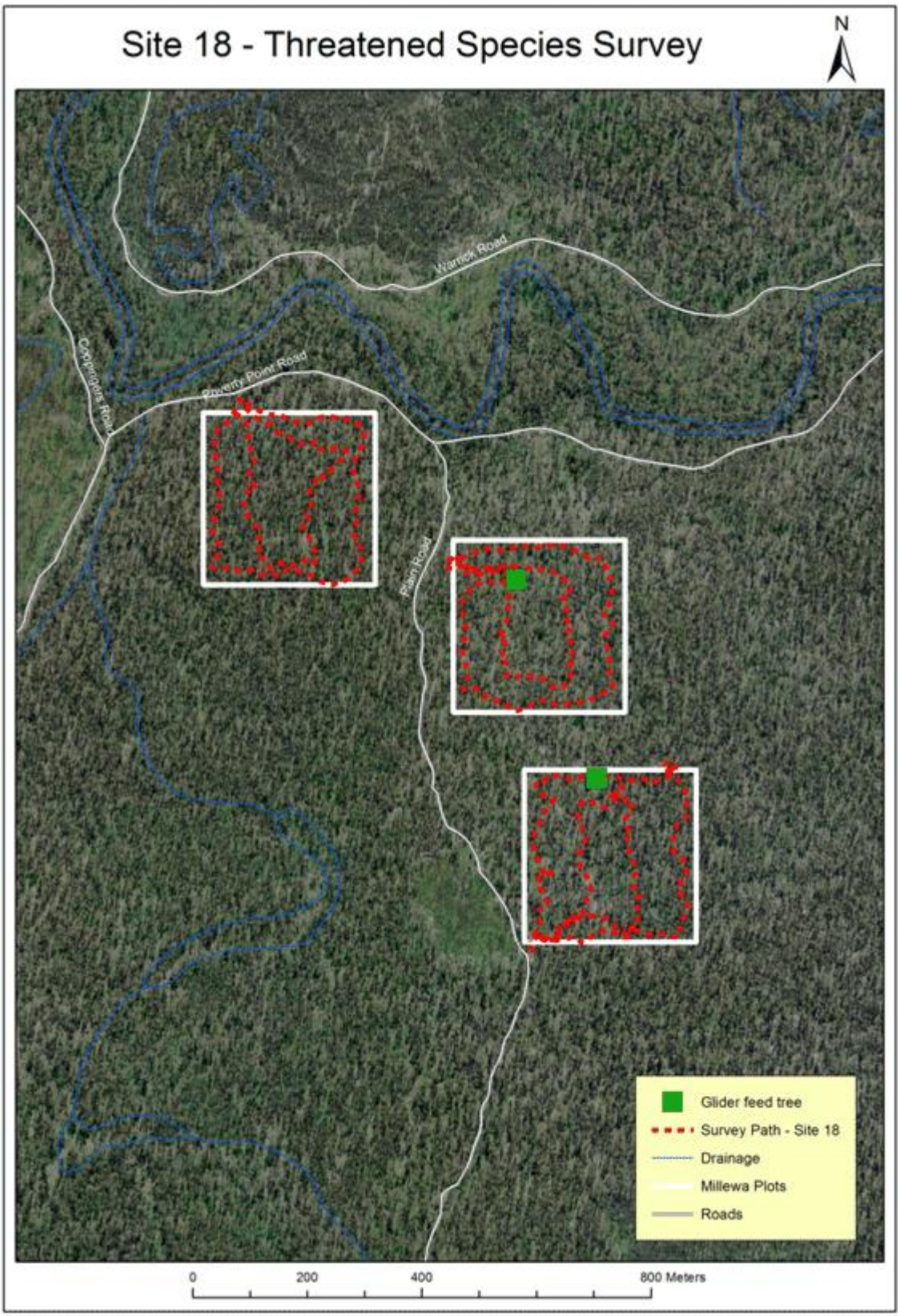
Species	Site No. FO51Mo	Site No. FO52Mo	Site No. FO55Mo
—	**Date: 14/6/15**	**Date: 14/6/15**	**Date: 14/6/15**
—	**Distance from site 18: 1.1km**	**Distance from site 18: 1.8km**	**Distance from site 18: 1.4km**
Barking Owl	-	-	-
Barn Owl	X	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	X	X	-
Australian Raven	X	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	X
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	X	X
Golden Whistler	-	-	-
Grey Fantail	-	-	-
Grey Shrike-thrush	X	-	X
Jacky Winter	X	X	-
Laughing Kookaburra	X	X	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	X	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	X	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	X	-
Red-capped Robin	-	-	-
Red-rumped Parrot	X	X	X
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	X	X	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	-	-
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	X	X	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	X	X	X
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	X	X
Yellow-rumped Thornbill	-	X	-
Yellow Thornbill	-	-	-
Common Bronzewing	-	X	-
Mountain Duck	-	X	X
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 18 Plot route and features survey



Site Number 19

Date(s) surveyed 5 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	6	10	16
Hollow bearing trees >1m	1	1	1
Stags (>1m) or <1m with hollows	11	24	17
Total hollows	**18**	**35**	**34**
Glider Feed trees	-	-	-
Raptor or waterbird nests	-	-	-

Comments

A lot of dead and dying trees throughout these 3 plots.

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

Species	Site No. FO10Gl	Site No. FO11Mo	Site No. FO12Gl
—	**Date: 3/8/15**	**Date: 3/8/15**	**Date: 3/8/15**
—	**Distance from site 19: 0.8km**	**Distance from site 19: 2.7km**	**Distance from site 19: 1.0km**
Barking Owl	-	-	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	X
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-

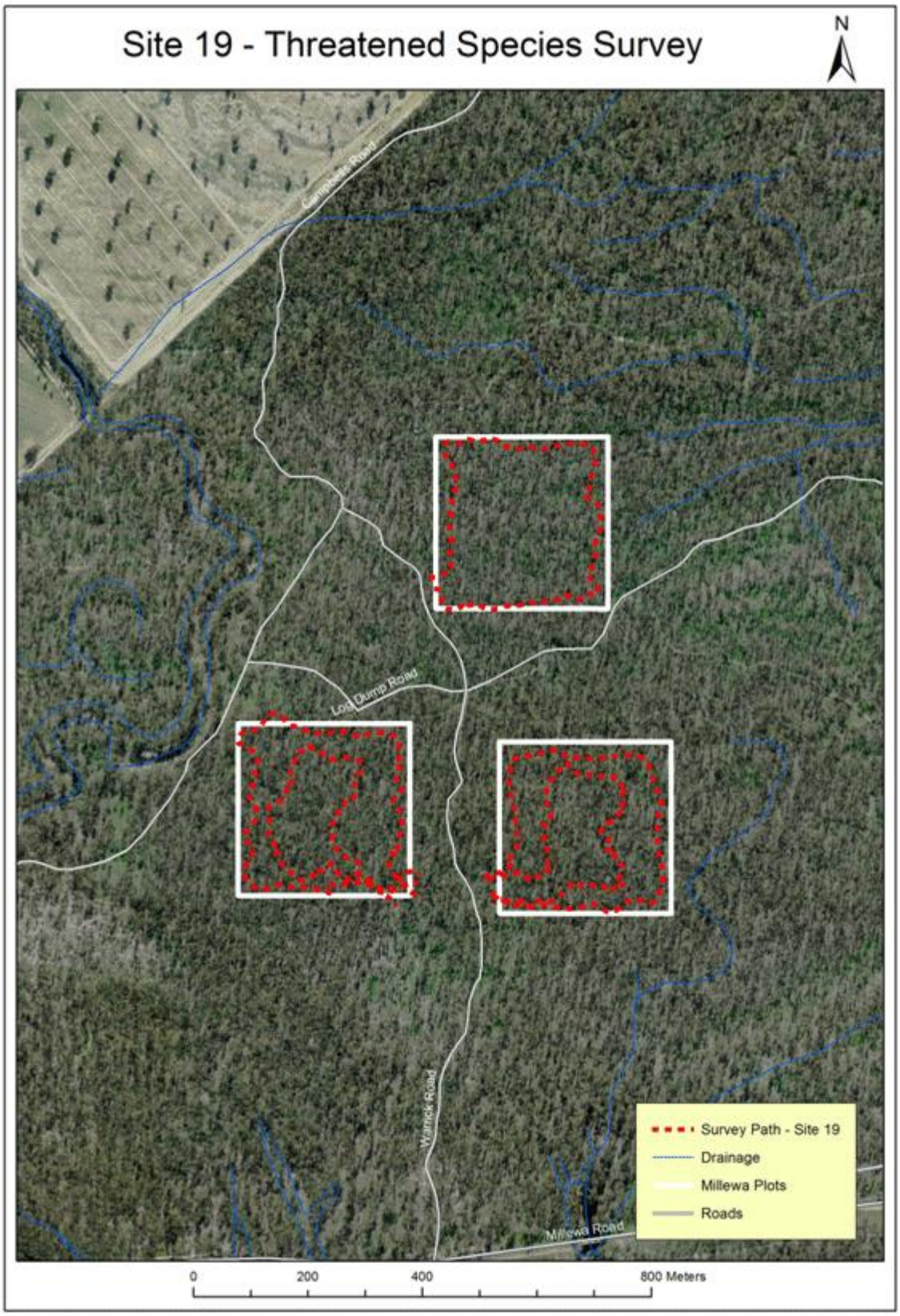
Species	Site No. FO10GI	Site No. FO11Mo	Site No. FO12GI
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	X	-
Australian Raven	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	-
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	-	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	-	-	X
Golden Whistler	-	-	-
Grey Fantail	-	-	-
Grey Shrike-thrush	-	-	-
Jacky Winter	-	-	-
Laughing Kookaburra	-	X	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	X	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-
Rufous Whistler	-	-	-
Scarlet Robin	X	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	X	-	X
Sulphur-crested Cockatoo	-	X	-
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	X	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	X	X
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	-	X	-
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	X	-	X
Whistling Kite	-	-	X
Silvereye	-	-	X
Nankeen Kestrel	-	X	-
Common Bronzewing	-	X	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 19 Plot route and features survey



Site Number 20

Date(s) surveyed 5 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	12	15	21
Hollow bearing trees >1m	12	11	13
Stags (>1m) or <1m with hollows	9	22	15
Total hollows	**33**	**43**	**49**
Glider Feed trees	1	1	4
Raptor or waterbird nests	-	-	1

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

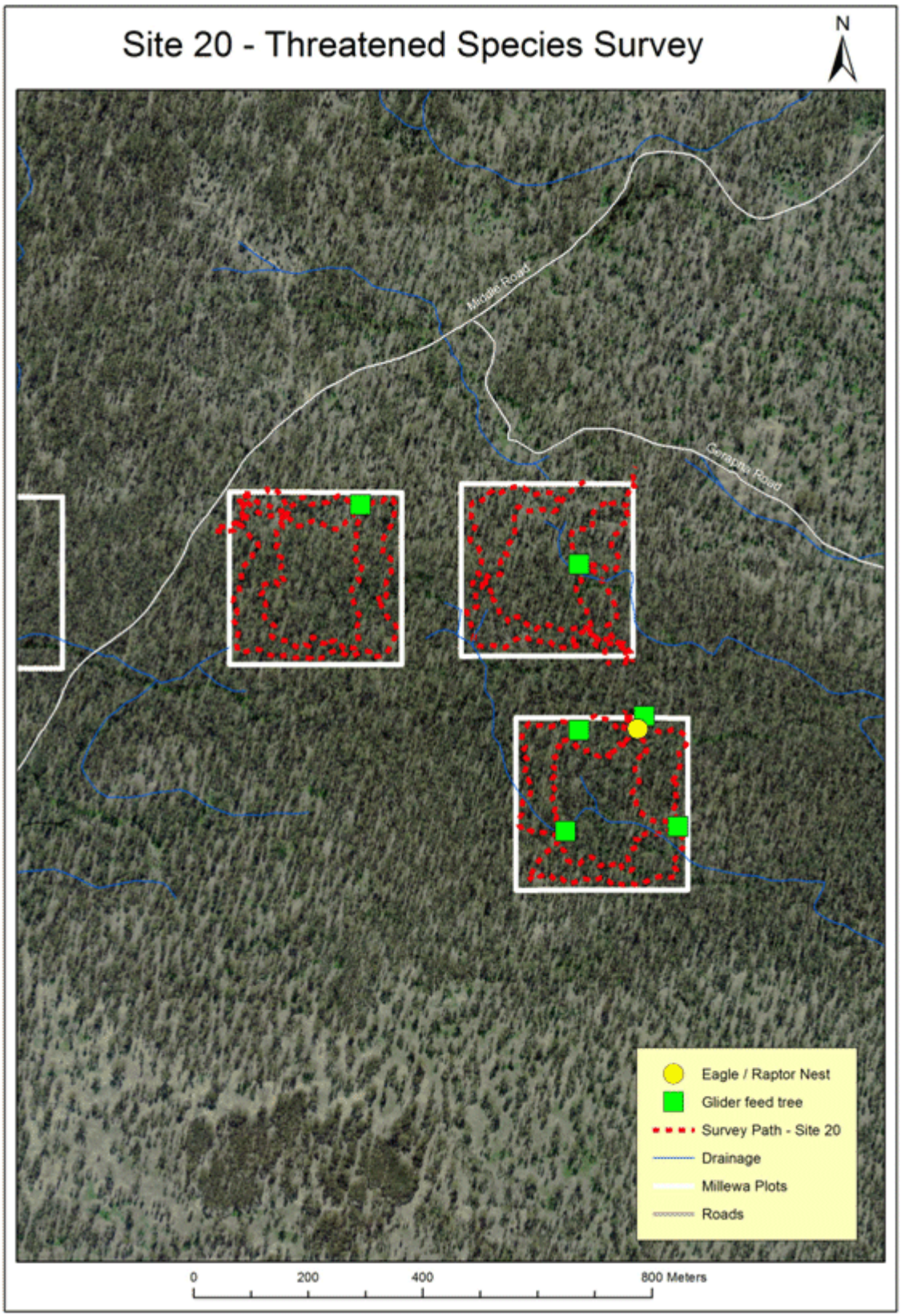
Species	Site No. FO26Mi	Site No. FO28Mi	Site No. FO29Mi
—	**Date: 9/6/15**	**Date: 9/6/15**	**Date: 9/6/15**
—	**Distance from site 20: 1.0km**	**Distance from site 20: 1.7km**	**Distance from site 20: 1.8km**
Barking Owl	-	-	-
Barn Owl	X	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	X
Australian Raven	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	-
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	-	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	X
Fantail Cuckoo	-	-	-
Galah	X	-	-
Golden Whistler	X	-	-
Grey Fantail	-	-	-
Grey Shrike-thrush	-	-	X
Jacky Winter	-	-	-
Laughing Kookaburra	-	-	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	-
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	-	-	X
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	X	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	X	-	-
Weebill	X	X	X
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	-
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	X	-
Yellow Thornbill	-	X	X
Boobook Owl	X	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 20 Plot route and features survey



Site Number 21

Date(s) surveyed 7 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	34	48	33
Hollow bearing trees >1m	21	12	14
Stags (>1m) or <1m with hollows	49	24	31
Total hollows	**104**	**84**	**88**
Glider Feed trees	2	1	-
Raptor or waterbird nests	-	-	-

Comments

Isolated cluster of Grey Box (2) in Plot 21-2 (eastern), 21-1: Cluster of feed trees within 30m, 21-2 Cluster of feed trees under large habitat tree & 21-3: Grey box in NW corner and on N edge.

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

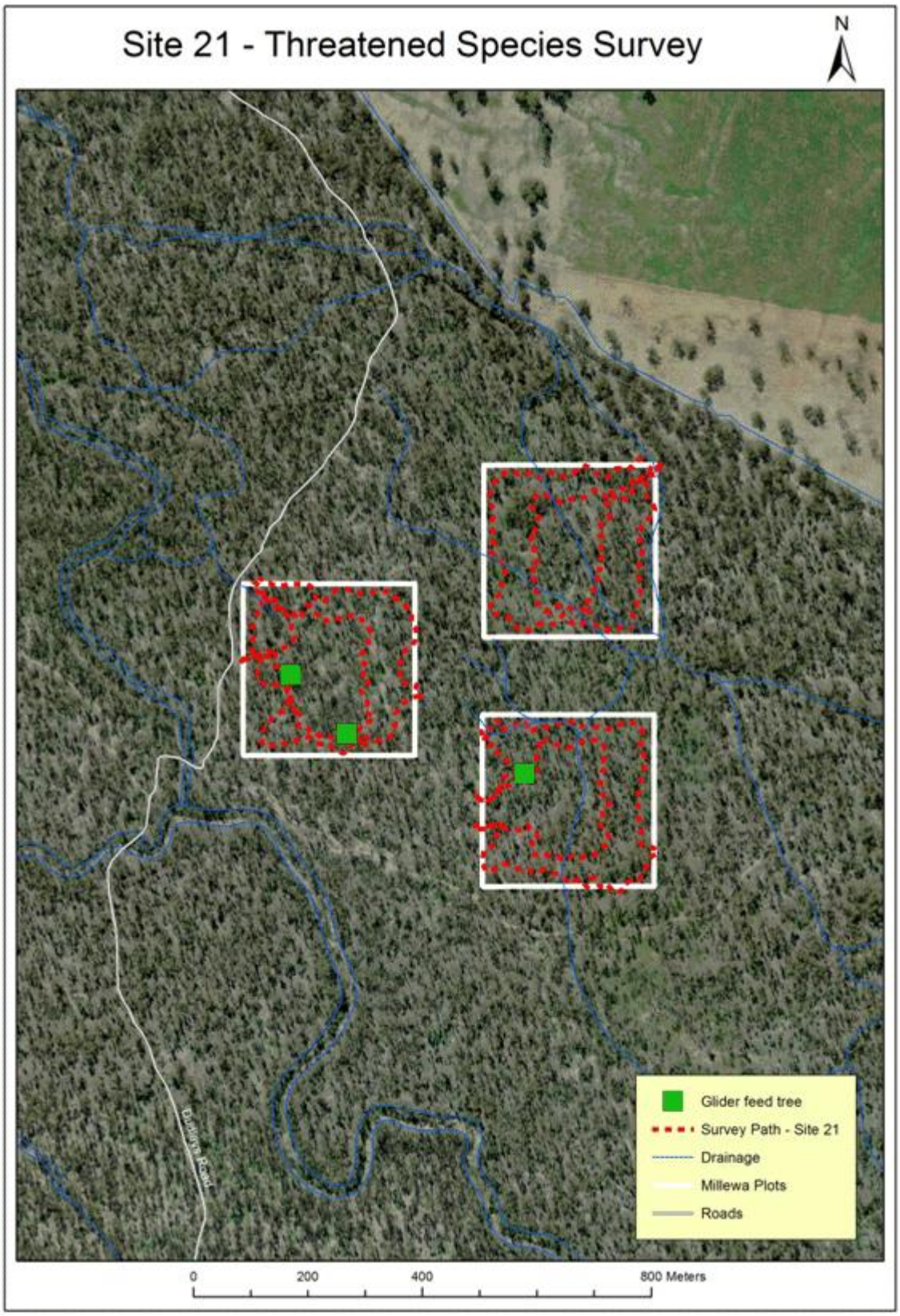
Species	Site No. FO23Mi	Site No. FO24Mi	Site No. FO25Mi
—	**-**	**-**	**-**
—	**-**	**-**	**-**
Barking Owl	-	-	-
Barn Owl	X	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	-	-	X
Common Ringtail Possum	-	-	X
Owlet Nightjar	-	-	X

Day surveys

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Australian Magpie	-	-	X
Australian Raven	-	-	-
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	X	X	X
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	-	-
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	-	X
Golden Whistler	-	X	-
Grey Fantail	-	-	X
Grey Shrike-thrush	X	X	X
Jacky Winter	-	-	X
Laughing Kookaburra	-	-	-
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	X	-
Noisy Friarbird	-	-	-
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	-	X
Pied Currawong	-	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	X
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	X

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	-	-	-
Sulphur-crested Cockatoo	X	X	X
Superb Blue-wren	X	X	X
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	X	-	-
Weebill	X	-	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	X	-
White-throated Treecreeper	X	X	X
White-winged Chough	-	-	X
Willie Wagtail	-	X	-
Wood Duck	-	-	-
Yellow Rosella	-	-	X
Yellow-rumped Thornbill	X	-	-
Yellow Thornbill	X	-	-
Peregrine Falcon	X	-	-
Red-browed Finch	-	-	X
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 21 Plot route and features survey



Site Number 22

Date(s) surveyed 7 August 2015

Table 1 Habitat features

Values	Plot No. 1	Plot No. 2	Plot No. 3
Hollow bearing trees <1m dbh	27	31	30
Hollow bearing trees>1m	8	2	5
Stags (>1m) or <1m with hollows	40	29	20
Total hollows	**75**	**62**	**55**
Glider Feed trees	6	7	2
Raptor or waterbird nests	-	-	-

Comments

Spotlight and call playback surveys

Surveys for large forest owls were undertaken between June and August 2015. These surveys were undertaken at sites previously surveyed in 2004 during a broad-scale systematic survey in State Forests. The nearest three forest owl survey points are used to determine the possible presence of threatened owl species.

Call-back of targeted species (Powerful Owl, Masked Owl and Barking Owl) were played at each site, with listening periods between owl calls and a 20 minute listening and spotlighting period after the call backs were completed.

Records of threatened owl species resulting from these surveys will be followed up on a minimum of three nights in an effort to determine the location of roost and/or trees.

Repeat surveys of all large forest owl survey sites will be undertaken during spring 2015 in order to further inform the site planning processes.

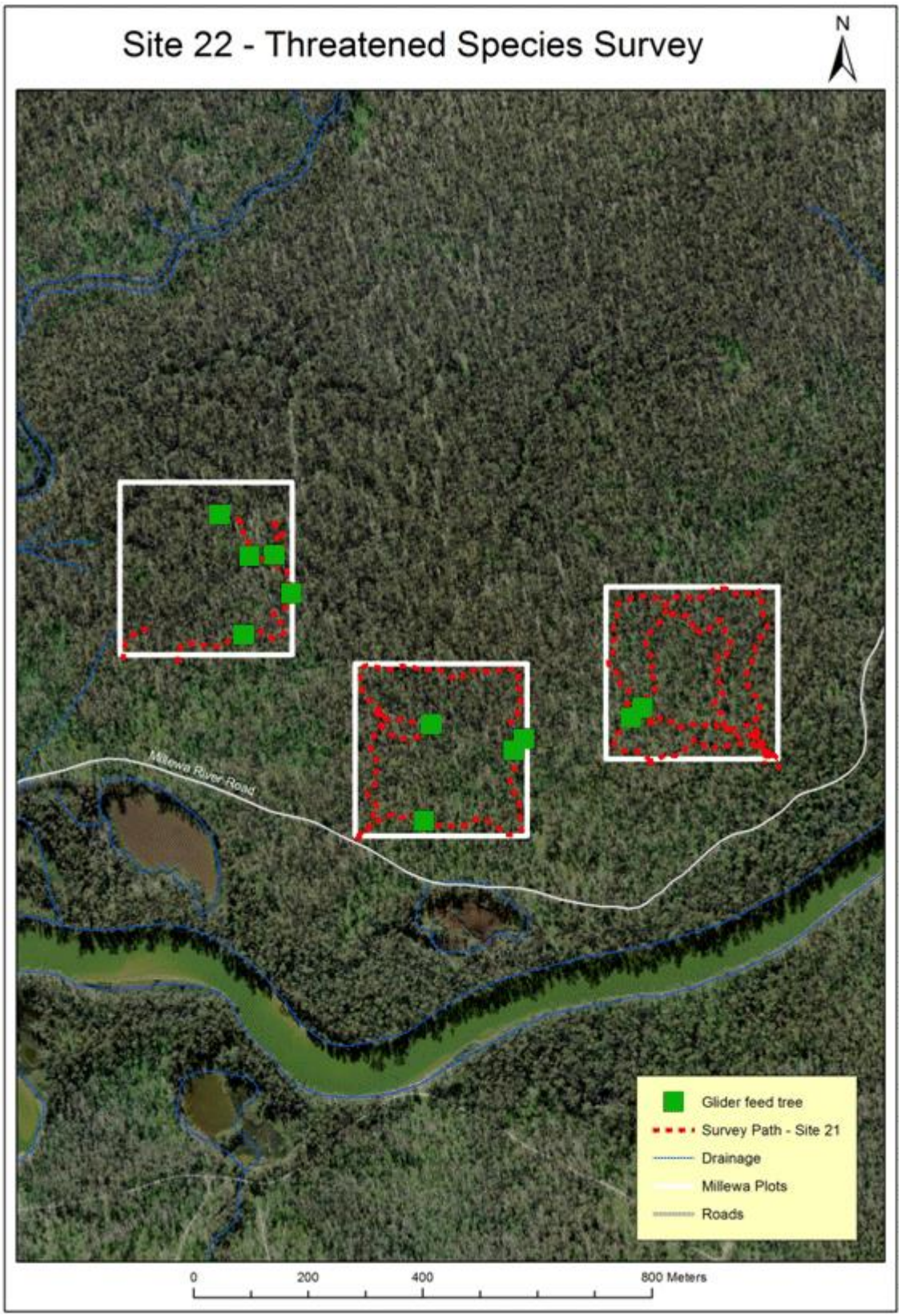
Species	Site No. FO31Mi	Site No. FO32Mi	Site No. FO47Mi
—	**Date: 3/8/15**	**Date: 11/6/15**	**Date: 11/6/15**
—	**Distance from site 22: 2.0km**	**Distance from site 22: 2.1km**	**Distance from site 22: 0.2km**
Barking Owl	-	-	-
Barn Owl	-	-	-
Boobook Owl	-	-	-
Common Brush-tail Possum	X	-	-
Common Ringtail Possum	-	-	-
Sugar Glider	-	-	-
White-striped Mastiff Bat	-	-	-
Tawny Frogmouth	-	-	-

Day surveys

Species recorded	Plot No. 1	Plot No. 2	Plot No. 3
Australian Magpie	-	-	X
Australian Raven	-	-	X
Black-faced Cuckoo-shrike	-	-	-
Brown Falcon	-	-	-
Brown Tree-creeper	-	-	-
Brown-headed Honeyeater	-	-	-
Buff-rumped Thornbill	X	X	X
Crested Pigeon	-	-	-
Crested Shrike-tit	-	-	-
Dusky Woodswallow	-	-	-
Eastern Rosella	-	-	-
Emu	-	-	-
Fantail Cuckoo	-	-	-
Galah	X	-	-
Golden Whistler	-	-	-
Grey Fantail	X	-	-
Grey Shrike-thrush	-	X	-
Jacky Winter	-	X	-
Laughing Kookaburra	X	X	X
Little Friarbird	-	-	-
Little Raven	-	-	-
Long-billed Corella	-	-	-
Masked Owl	-	-	-
Mistletoe Bird	-	-	-
Noisy Friarbird	-	-	X
Noisy Friarbird	-	-	-
Noisy Miner	-	-	-
Owlet Nightjar	-	-	-
Peaceful Dove	-	X	-
Pied Currawong	X	-	-
Red-capped Robin	-	-	-
Red-rumped Parrot	-	-	-
Red Wattlebird	-	-	-
Restless Flycatcher	-	-	-

Species recorded	**Plot No. 1**	**Plot No. 2**	**Plot No. 3**
Rufous Whistler	-	-	-
Scarlet Robin	-	-	-
Shining Bronze-Cuckoo	-	-	-
Silvereye	-	-	-
Spotted Pardalote	-	-	-
Striated Pardalote	-	-	-
Striated Thornbill	-	X	-
Sulphur-crested Cockatoo	X	-	X
Superb Blue-wren	-	-	-
Tree Martin	-	-	-
Varied Sittella	-	-	-
Wedge-tail Eagle	-	-	-
Weebill	-	X	-
Welcome Swallow	-	-	-
White-browed Babbler	-	-	-
White-browed Scrubwren	-	-	-
White-plumed Honeyeater	-	-	-
White-throated Treecreeper	X	X	-
White-winged Chough	X	X	X
Willie Wagtail	-	-	-
Wood Duck	-	-	-
Yellow Rosella	X	X	X
Yellow-rumped Thornbill	-	-	-
Yellow Thornbill	-	-	-
Pelican	X	-	-
Yellow-footed Antechinus	-	-	-
Eastern Grey Kangaroo	-	-	-

Figure 22 Plot route and features survey



Appendix 5 – Example operational plans to be updated

Office of Environment & Heritage
NSW National Parks & Wildlife Service

NSW National Parks & Wildlife Service - Western Rivers Region Ecological Thinning Trial Operational Plan – Site Two (Coolamon Crossing), Murray Valley National Park – 2014

Appendix 5 – Example operational plans to be updated

Contents

Area identification

Region	Western Rivers
Management Area	Murray
National Park	Murray Valley
Site Descriptor	Site Two (Coolamon Crossing)

1. Description of operation

1.1. Thinning Methods

This operation will involve the thinning of River Red Gum (*E. camaldulensis*) with a maximum diameter breast height over bark (dbhob) of 40cm.This process will involve the selective removal of trees and retaining the trees with the best growth and potential to maintain vigour and develop into large hollow bearing trees with large spreading crowns.

1.2. Road construction and maintenance

The current network of existing roads will be routinely maintained. A series of natural surface tracks may be constructed within the planning area to facilitate this trial. These tracks will be located in the field by a representative from the Office of Environment & Heritage (OEH). These tracks will be closed and allowed to revegetate once the thinning trial is complete.

1.3. Debris and regeneration management

All pre-existing dead wood on the forest floor within the treatment area will be retained. Where required, thinned material will be retained within the treatment area to provide a total level of coarse woody debris of no less than 45 tonnes per hectare (and no greater than 50 tonnes/ha). A range of size classes of woody debris will be retained, principally by ensuring all pre-existing material is retained, but then also by selectively identifying woody debris for retention based on providing a range of size classes. Where there is greater than 50 tonnes/ha of coarse woody debris on-site after treatment, wood will be provided for river restoration works and domestic firewood.

1.4. Flora, fauna, soil and water management

A strategic network of exclusion areas protect and maintain environmental values throughout the Park. Site specific prescriptions to protect flora, fauna, and soil and water values within the trial area have been incorporated into this plan.

2. Thinning Prescriptions

2.1. Thinning prescriptions:

Thinning will be carried out with the use of mechanical harvesters. Stumps will be painted immediately after cutting with a biactive glyphosate (50:50 mix) to control coppice regrowth.

- *Thinning shall be applied to River Red Gum individuals only.*

- *Thinning shall be carried out to create average tree spacings of 7 metres or 15 metres. (Refer to map)*
- *All trees greater than 40 cm dbhob **will not be** felled, or damaged during thinning operations.*
- *Thinning debris must not be accumulated around trees marked for retention.*
- *All trees containing visible hollows (habitat trees), regardless of size, will be retained, and must not be damaged during thinning operations.*
- *Dead standing trees greater than 20cm dbh will not be felled or damaged unless deemed unsafe during the mark-up or during the operation. All existing dead wood on the forest floor will be retained.*
- *All understorey shrubs including native cherry & silver wattle will be protected.*
- *Thinning must follow the marking specifications as contained in Section 10 of this Plan.*
- *Tree marking will be for retention.*
- *Thinning must aim to minimise damage to **all** retained trees.*

2.2. Coarse Woody Debris Prescriptions

- *Across the area, where the coarse woody debris level does not meet 45 tonnes/hectare (see Attachment 1), sufficient on-ground residue from the current operation must be retained to resemble that in the photo standards. Coarse woody debris needs to be dispersed across the site rather than in clumps.*
- *Thinning and road/track construction must minimise disturbance to debris and naturally fallen woody debris existing prior to the current operation. Particular care is to be taken, not to disturb decaying logs greater than 20 cm in diameter. Specifically, and wherever possible, machinery will be required to work around pre-existing large woody debris greater than 20 cm diameter to ensure these habitat features are not crushed or disturbed.*

3. Legal conditions & Responsibilities

3.1. Legal Conditions

This operation must comply with:

- *Site-specific conditions of this Operational Plan.*
- *National Parks and Wildlife Act 1974*
- *Threatened Species Conservation Act 1995 and amendments*
- *National Park Estate (Riverina Red Gum Reservations) Act 2010*
- *Fisheries Management Act 1994*
- *Protection of the Environment Operations Act 1997*
- *Work Health and Safety Act, 2011 & Work Health and Safety Regulations, 2011*
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

3.2. Responsibilities

3.2.1. Thinning contractor responsibilities

- *Unless indicated to the contrary, the thinning contractor shall be responsible for all thinning operations (including thinning and debris management; forwarding; dump site construction and rehabilitation; minor road construction; loading; haulage and waste*

management) and the implementation of a Safety Management System for their operation (Section 6). The thinning contractor shall also be responsible for all repairs of damage caused by the thinning operation to roads, signs, fences and other structures.

3.2.2. Senior Field Supervisor (SFS) responsibilities

- *Unless indicated to the contrary, the SFS shall be responsible for locating and marking all planning area boundaries, non-harvest areas, dump sites, and proposed roads and their crossings. The SFS shall be responsible for all marking, including the marking of trees for removal or retention, the protection of flora and fauna habitat features, and for information purposes (see Section 12). The SFS shall also be responsible for all compliance inspections, recording and reporting.*

3.2.3. Plan availability

- *Copies of this thinning plan **must** be held available by the contractor at the site of operations at all times that felling, processing or earthworks are being undertaken within the area covered by this plan.*

4. Special conditions

4.1. Operational map boundaries

All boundaries on the Operational Map are indicative only. Actual boundaries established in the field have precedence over boundaries shown on the Operational Map

- *The Senior Field Supervisor (SFS) must report to the Senior Project Officer-Forests (SPO-Forests) where discernible differences are noted between the mapped and actual boundaries and record any changes in the SFS' copy of the Plan.*

4.2. Non-Treatment Areas

The Operational Map indicates the non-treatment areas in the planning area, as shown in the legend.

- *Thinning disturbance is not permitted in non-treatment areas*

Details of non-treatment areas are described below:

4.2.1. Plot boundary

The boundaries of the trial area have been marked according to the harvest marking specifications.

- *Any disturbance carried out by this activity is prohibited beyond these boundaries.*

4.3. Third party interests

4.3.1. Bee hives

There are occupation permits for bee keeping over the area. No hives are present at this point in time.

- *In the event that hives are placed in the forest during the operation, thinning is to cease and the SPO-Forests will instruct the permittee to move them.*

5. Safety conditions

5.1. Traffic control

- *Poverty Point Road, Coolamon Road & Porters Creek Road will be closed, at various times, to traffic whilst operations are in progress.*
- *Signs shall be erected on all roads leading into the site, informing visitors of the activity*

5.2. Risk assessment information for Job Safety Analysis

Hazards identified during planning, together with suggested control strategies, are contained in the Site Safety Plan Coolamon Crossing document.

- *The thinning contractor must ensure that any additional site-specific hazards identified during the operation are included in the Site Safety Plan and controls are put in place. .*

5.3. Emergency management planning information

Details relating to the location of the Emergency Evacuation Point for this operation are also included in the Site Safety Plan.

6. Cultural heritage conditions

Pre-thinning surveys have been carried out on the 17/6/12. Sites of cultural significance were located within the “Northern plot” and also to the north of the “Central” plot.

- *An exclusion zone of 25m will be marked around these sites.*
- *Contractor must inform the SFS of the location of all cultural heritage sites detected during the operation and must not disturb them.*
- *Harvesting machinery must also not operate on or within 50 m of the sandhills.*

7. Flora and fauna conditions

7.1. General conditions

7.1.1. Pre-thinning inspections

- *Pre-thinning surveys were carried out on the 31/5/12 to search for the presence of threatened species of flora and fauna. These surveys included a search for habitat features, or indicators of the presence, of threatened species of fauna. These may include nest, den and roost sites, pellets and scats, latrine and den sites, “feeding-notch” trees, skeletal remains, and animal diggings.*

7.1.2. Reporting

- *Contractor must report the location of threatened species of flora and fauna, detected during the operation, to the SFS. The SPO-Forests will seek advice from the OEH South Branch Regional Manager (South West) and provide feedback on the best management option and amend the operational plan.*

7.2. Exclusion zones

No exclusion zones for threatened species are required on this site.

7.3. Species-specific conditions - flora

There are no threatened flora species recorded in the planning area.

7.4. Species-specific conditions - fauna

A large stick nest has been located in the southern plot. An exclusion zone of 200m will be placed around this nest.

During the threatened species surveys, a fishing bat (*Myotis macropus*) was located to the west of the central plot. This species should not be affected by this operation.

8. Soil and drainage feature conditions

8.1. Road/track location and construction

- *Existing and proposed roads approved for access are shown on the Operational Map.*
- *The location of proposed roads/tracks must be marked in the field by OEH prior to their construction.*
- *Use of other unmapped roads/trails and other significant additional construction requires prior written approval by the Senior Project Officer - Forests.*

8.2. Crossings

- *All crossings must be bed-level causeways, culverts or bridges. 'Block banks' are not permitted.*
- *All culverts or bridges are to be temporary and are to be removed once extraction of thinning material is complete, unless otherwise instructed by the SFS.*

8.3. Earthworks

- *"Blading off" vegetation, and the shifting of soil to form tracks, roads, crossings or dumps, is prohibited, unless authorised by the OEH.*
- *Wherever practicable, vehicle movements should be on higher ground and should avoid flood runners.*

8.4. Defined waterways

Defined waterways are defined as depressions that are intermittently inundated by floodwater, that retain floodwater after it recedes from the general floodplain and that do not support mature River Red Gum trees. Defined waterways have been identified using the Australian Government and Murray Darling Basin Authority's Wetland Data, ADS40 high resolution digital aerial photography, the Forest Management Zoning System and site inspection.

Duck Lagoon is located to the north of the northern plot.

8.5. Drainage depressions

There are mapped waterways running within or alongside two of the plots.

An exclusion zone of 50m will be marked along either side of these waterways:

- *Thinning is prohibited within exclusion zones.*

- *All practical precautions must be taken to avoid felling trees into exclusion zones.*
- *Machinery must not enter exclusion zones, except for routine maintenance of existing roads, or for the construction and operation of temporary roads, in which case roads must be sited to minimise disturbance to exclusion zones, or for the traversing of exclusion zones on existing roads.*

There are no unmapped depressions identified as requiring additional protection. If they are located, an exclusion zone of 20m will be marked along either side of the waterway.

9. Wet weather conditions

Wet weather closures will apply when conditions are such that thinning activities are likely to cause unsafe conditions or unacceptable levels of damage to assets (roads, bridges, ramps etc) and/or the forest.

- *Treatment activities will cease during or immediately following rainfall events, or where floodwater has encroached onto a site.*
- *Manual tree felling must automatically cease when exposed working surfaces are saturated and/or working conditions are dangerous.*
- *Mechanical felling/processing/forwarding must automatically cease when machinery creates one or more ruts with a depth of 20cm below natural ground level and a length of 10 metres.*
- *Loading/haulage must automatically cease when soil conditions are such that traction of wheeled vehicles is difficult to maintain.*
- *Mechanical extraction (from the forest or stockpile site) must not occur after a rainfall event until permission is granted by the SFS.*

Walkover techniques are to be used, as much as possible, to protect the ground layer.

10. Fire Restrictions

- *Solid fuel fires are not permitted during the Bushfire Danger Period.*
- *Any machinery that may be a source of ignition is not to be used during periods of extreme fire danger or days of Total Fire Ban.*
- *Fire extinguishers (water only) are to be readily available in periods of high fire danger.*
- *Chainsaws and machinery are to be fitted with functioning spark arresters.*
- *Welding and oxy-acetylene equipment is not permitted on days of extreme fire danger or during a Total fire Ban.*

11. Hazardous substances & waste management

- *In the event of any spillage of fuel or oils, contaminated soils will be removed and disposed of at a suitable landfill site.*
- *Contractors will be required be to have fuel spill kits located on site.*
- *A mobile fuel tank must not be located within, or within 10 metres of the boundary of, a drainage feature.*
- *All servicing and repairs of equipment must be carried out in a manner that prevents the pollution of surface and groundwater.*
- *All rubbish generated during the operation will be collected on a daily basis and removed from site and disposed of in an appropriate and responsible manner.*

- *The herbicide MSDS is to be read carefully and followed.*
- *Herbicide is to be mixed, and equipment rinsed off-site. Clean water supply to be located at this site.*
- *Herbicide is to be securely transported, away from any food products.*
- *Herbicide is be stored safely off-site and disposed of appropriately.*

12. Marking specifications

12.1. Standard Markings/Symbols

Standard Markings	Symbols
Management boundary Where not clearly defined by features, eg road, trail, creek	**"O"**
Non harvest area boundary Line not to be crossed or disturbed by fallers or machinery at any time	**Three rings**
Extraction system Road/track line	**"I"**
Approved road crossing site	**"↕"**
Silviculture system Retained trees not to be removed or damaged.	**One ring**
Cancellation mark Mark to formally cancel previous marks	**"X"**

12.2. Specialist Markings/Symbols

Specialist Markings	Symbols
Flora/fauna features Threatened plant	**"TP"**
Nest (raptors, parrots etc.)	**"N"**
Owl nest and/or roost	**One horizontal line or ring** *PLUS* **"OWL"**
Glider sap feed tree, record or nest	**"G"**

13. Certification

PLAN PREPARATION

Prepared by: _____ Date:_____

Senior Rehabilitation Officer – Forests

Signature: _____

INTERIM REGIONAL APPROVAL

Endorsed by: _____ Date:_____

Landforms & Rehabilitation Team Manager

Signature: _____

FINAL REGIONAL APPROVAL

I note approval of this Trial Ecological Thinning Plan from the above-mentioned authorities, together with the amendments they have required to be included in the Plan. These amendments have been included in the final Plan. This Trial Ecological Thinning Plan comprises pages 1 – 12, attachments and the Operational and Location maps marked and referenced to this Trial Ecological Thinning. This Trial Ecological Thinning Plan is for Murray Valley National Park.

Approved by: _____ Date:_____

REGIONAL MANAGER

Signature: _____

14. Thinning plan amendment record

I acknowledge that I have received a copy of the following Amendment to the Trial Ecological Thinning Plan for Murray Valley National Park. I have incorporated the new conditions into the plan as instructed in the Amendment.

I have been briefed on the conditions of the Amendment and understand the supervision and operational control requirements, as explained to me by the Adaptive Unit Manager or an authorised delegate of the manager.

I am aware that I am responsible for informing all relevant personnel involved in this operation of these aspects of the Amendment.

Amendment number	Date received	Signature

NOTES

Date operation commenced: Page _____

Date operation ceased:

Date	Authorisation given/hazard identified/instruction made/comments

Date	Authorisation given/hazard identified/instruction made/comments

15. Record of threatened plants or threatened fauna features

Note: Some features or species require no further prescription but should still be recorded while other features or species require an immediate prescription and/or further survey before thinning may continue in the vicinity.

Species or features detected (include type, number, etc.)	Location (GDA reference) Easting (6-digit)	Location (GDA reference) Northing (7-digit)	Action taken	Date SPO-Forests notified

Notes on Checklist

Locations of features should be noted on map.

Attachment 1 – OEH On-ground Residue Photo Standard

(The **density** and **nature** of on-ground residue must, at a minimum, **resemble** this photo after thinning is complete).

Appendix 6 – Independent Review of Ecological Thinning Study Design (Robinson 2011)

Review of Ecological Thinning Study Design

Prepared for

NSW Office of Environment and Heritage, Parks Victoria and the Victorian Department of Sustainability and Environment

November 24, 2011

Andrew Robinson, PhD.

Acknowledgements

This report was greatly enhanced by useful conversations with Professor Valerie LeMay of the University of British Columbia and Dr Patrick Baker of Monash University.

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1. EXECUTIVE SUMMARY

The proposed experimental design gets the big picture right. The design uses replication, blocking across anticipated gradients, hierarchical structure, and randomization as a basis for applying the experiment to the RRG forest. These are sound experimental design characteristics and applied appropriately.

The design proposes measurement and monitoring of an extensive suite of variables of interest; the variables occupy a reasonable and appropriate gradient of spatial and temporal scales, and are tightly connected to the motivating hypotheses. The design is very well motivated through extensive and correct use of the available scientific and grey literature. The outcome of the broad hypothesis tests is appropriately uncertain.

Some modifications may improve the specification, robustness, or utility of the design, and are described briefly here. Further details are presented in the report.

1. The aims should be drafted to reflect the broad sweep of interest.
2. The count of sites in the low stem density stratum should be increased.
3. The site count and treatment specification should be as balanced as possible across state boundaries.
4. Remote sensing instruments such as SPOT should be canvassed as candidate tools for measuring stand-level crown treatment response.
5. Digital photography should be canvassed as a candidate tool for measuring tree-level crown treatment response.
6. The quarter-hectare sub-plots for mature trees should be stem-mapped before and after treatment.
7. The post-treatment health of the remaining stems should be recorded, for example as damage class or health class.
8. Some choice should be made about the size of the statistical tests that will be used for the motivating hypotheses.
9. When the data are collected, the analysis of the data should proceed at multiple levels.

2. INTRODUCTION

2.1 PURPOSE

I report an assessment of the experimental design and measurement methodology for an ecological thinning study proposed for river red gum (RRG) reserves in both New South Wales (NSW) and Victoria.

The proposed design is motivated by concerns that changes in patterns of moisture availability are leading to the RRG-based ecosystem approaching senescence, which is impeding the development of ecologically desirable characteristics, such as large numbers of hollow-bearing trees. A concomitant problem is that tree crowns are dying back under the regular incidences of moisture stress.

The assessment is based on information provided in two draft documents, and interviews of key researchers and managers. The two documents are entitled "Ecological Thinning Trial in NSW and Victorian River Red Gum Reserves", sent 6/10/11, and "Synopsis of Proposed Experimental Design" sent 21/10/2011, and an update sent the same day, all provided by Dr Emma Gorrod (OEH).

2.2 BACKGROUND

The following brief historical summary is excerpted from the design proposal (Anonymous 2011). The RRG forests were previously managed for production of timber products (Anonymous 2011). Mac Nally et al. (2011) speculated that before European settlement, the RRG forest structure was dominated by large, spreading trees with a mosaic of mixed-age and high-density, even-aged patches. The high-density, even-aged stands resulted from disturbance-driven reproductive cycles which depend on flood and fire. The cycles were probably impeded by drought, excessive flood, and competition. Recent land management strategies and altered flood regimes have led to the establishment of dense, even-aged forests that comprise mainly slender trees with few large hollow-bearing trees and small amounts of fallen timber (Mac Nally et al. 2011). Consequently, due to anthropogenic interference, a large proportion of the RRG forests are high-density and even-aged stands.

The large proportion of high-density and even-aged stands may lead to a decline in biodiversity due to the lack of: large and hollow-bearing trees, reduced levels of coarse woody debris, and sufficient complexity in vegetation strata. Furthermore, there is a risk that the stands will stagnate and the system will not naturally move towards high-biodiversity profiles, that is, the opportunities for the recruitment of hollow-bearing trees and suitable profiles of woody debris will be limited. Finally, there is concern that the canopy of the forests is declining due to moisture stress, and the decline in canopy may indicate decline in resilience to perturbation, and may reduce the suitability of the ecosystem as habitat for some species.

2.3 PROBLEM STATEMENT

Ecological thinning is proposed as a management strategy to achieve the goals of (i) recruiting hollow-bearing trees, (ii) reducing the risk of large-scale mortality, and (iii) reducing the incidence of canopy dieback during drought. However, the overall effect of thinning upon these conditions is not known. Furthermore, in the case that the effect of thinning upon these conditions might vary depending on the nature of the local ecosystem, it is not known where on the landscape thinning might be best applied.

This experiment is intended to redress the lack of knowledge of the likely effects of ecological thinning in RRG forests, covering a range of initial conditions.

2.4 PROPOSED DESIGN

The proposed design is hierarchical, as follows. The landscape is divided into polygons by two classifying variables: stem *density* (stem count per unit area, three classes) and *water availability* (two classes), the latter of which will have mapped site quality as a proxy. Any forest with greater than 80% canopy damage will be excluded from the experiment.

Blocks will be established within randomly selected polygons that are sufficiently large; as a rough guide the blocks will need to be about 500 m by 1300 m. There will be 20 such blocks under the design; the blocks will be allocated to polygons within the classes according to the pattern reported in Table 1.

Table 1: Count of blocks to be established within combinations of stocking density and site quality.

	Water Availability	
Stem density	**SQ1**	**SQ2**
<200	1	1
200-399	4	4
>400	5	5

Within each block, three experimental plots of 9 ha will be established; these plots will be 100 m from roads, and themselves separated by a distance of about 100-300 m. Three treatments are planned: 1) a control, 2) thinning to average spacing of 7 m (204 = 10000 / 7^2 stems per hectare, sph), and 3) thinning to average spacing of 15 m (44 = 10000 / 15^2 sph). These three treatments will each be randomly allocated to one of the three plots.

The treatments will be applied to each plot after a pre-treatment survey. Any thinning will be performed mechanically (as opposed to being by hand). Trees that have hollows or are considered likely recruits will be retained.

A 0.25 ha permanent monitoring subplot will be established, within which 30 randomly selected trees with diameter at breast height (1.3 m, dbh) no less than 10 cm will be marked. Three 0.04 ha subplots will be randomly located within the subplot.

Measurements will be made of key parameters that represent a wide range of hypotheses. For example, measurements will be made of tree size (diameter, height, crown width), reproductive health, stand-level recruitment, litter depth, and structural diversity. These measurements will be made at varying spatial scales. Remeasurements of these key parameters to will be performed at varying temporal scales: some will be remeasured every year, and others every five years or so.

3. ASSESSMENT

3.1 LITERATURE REVIEW

I reviewed the literature provided by Dr Emma Gorrod and other resources available to me. The purpose of the review was three-fold: (i) to assess the ecological and statistical reasonableness of the conjectures that informed the experimental design, (ii) to try to find estimates of natural variability for the performance of components of the system, and (iii) to try to find estimates for the likely effects of the treatment and site-level variables upon target characteristics of the system. The balance of this section reflects the review.

Overall, the design choices and motivation are well supported by the available literature.

3.1.1 Rationale for Experiment

The conjectures that the RRG are competing for moisture, that inundation is important for RRG growth and reproduction, and that changes in that temporal patterns of inundation in the last 60 years may affect RRG, are reflected in Bren (1998). Major floods have occurred in 1870, 1917, 1931, 1956, and 1973-75. Estimated flood frequencies are presented in Bren's Table 2; characteristic vegetation alliances/classes in Table 1. Bren's figures 5 and 6 show flood frequencies for the 22 years 1963-1985.

Schonau and Coetzee (1989) discuss the effects of thinning as a function of initial stand density and spacing of eucalyptus plantations and raise the possibility that thinning could be counter-productive if the intention is to optimise production values. The authors claim that *E. camaldulensis* requires a dense stand to achieve the best form, but their definition of best form is probably very different than that targeted by the present study. In general, mean breast height diameter (dbh; 1.30 m) can increase with a reduction in stocking, and that this relationship is influenced by age, species and site (Opie et al., 1984, cited in S&C 1989). However, Ladrach (1983, cited in S&C 1989) did not find the relationship between dbh and stocking significant for *E. camaldulensis*; this species has particular growth habits (about which no further information

was provided) and he sampled trees occurring in fence rows, which may have been free growing and therefore not affected by competition. Overall, the likely effects of different levels of thinning on different parts of the RRG forest are therefore open to some question relative to the goals of the present study, and this openness provides excellent motivation for the study itself.

The long-term goal of recruiting hollow-bearing trees using ecological thinning seems well supported. Gibbons and Lindenmayer (1996) provide a framework for thinking about managing for hollow creation and retention. Hollows make take hundreds of years to form. Thomson et al. (2009) modeled hollow availability in the Barmah. They construct a forest growth model for RRG in the region. Simulations based on the growth model that incorporate variability in growth rates among trees and plots, and parameter uncertainty, suggest an absolute minimum age of 75 years before any trees would produce hollows under average growth conditions, but the average number of hollows per tree would remain < 1 beyond 150 years.

Coupled with data he collected on hollow ontogeny for *E. pilularis*, Mackowski (1987, cited in G & L 1996) calculated that a perpetual supply of three hollow-bearing trees per hectare could be met by managing the forest so it always supported the following: four sound trees per hectare 60-100 cm dbh; two hollow-bearing trees per hectare 100-140 cm dbh; and one hollow-bearing tree > 140 cm dbh per hectare, of which Eucalyptus trees are more likely to reach maturity and therefore develop cavities suitable for a range of hollow-dependent fauna. There is some evidence to suggest that hollow- bearing trees retained in logged forest should be surrounded by relatively undisturbed vegetation to enhance their protection. The study by Gibbons (1994a, cited in G & L 1996) showed that retained trees were more likely to remain standing as the basal area of live stems within the immediate 30 m of the tree increased.

Cunningham et al (2010) studied whether stand structure affected vulnerability to mortality. They constructed hierarchical mortality models. Their study suggests that dieback of RRG floodplain forests would be more effectively mitigated by increased water availability through flooding than by altering stand structure. Cunningham et al (2011) made forecasts of dieback for the system. This study provides the imperative for action in terms of 70% of the forest exhibiting die back.

3.1.2 Other impacts of treatment

The general ideas behind the use of judicious forest harvest to affect non-tree communities are well supported. Halpern and Spies (1995) describe the early responses of understory communities to forest harvest, and suggest how post-harvest practices that alter natural successional processes may influence long-term patterns of diversity and species occurrence. Robinson and Robinson (1999) assessed the effect of the creation of small gaps upon bird abundance in a deciduous forest in the USA, and found that most species were not significantly less common in harvested areas. Wilson and Carey (2000) found that forest management has

overall negative impacts on small mammals, compared with old-growth natural states, but that thinning management practices were better than legacy retention.

3.1.3 RRG information

RRG is a long-lived species, with reported ages ranging from 500 to 1000 (Jacobs 1955, Baur 1992; both cited in G&L 1996).

The Victorian Environmental Assessment Council (VEAC 2007, cited in Thomson et al. 2009) estimated mean diameter growth rates of just 0.19 cm yr^{-1} in the period 1987 to 1995, compared with an average rate of 0.39 cm yr^{-1} over the previous four decades.

Horner et al (2009) report a historical study on the effects of drought on even-aged RRG. Bacon et al. (1993) observed that other drought survival mechanisms include extensive leaf fall under dry conditions (Briggs and Maher 1983, cited in Bacon et al 1993), which presumably explains the die-back phenomenon.

Opie (1969) found that retained large, mature River Red Gum (*E. camaldulensis*) suppressed regrowth at distances from the retained tree greater than the crown diameter.

3.1.4 Measuring Treatment Impact

Cunningham et al (2007) provide some quantitative stand variables that can be used to report stand health for RRG. Suggest that the condition of *E. camaldulensis* stands would be adequately assessed with an index that includes percentage live basal area, plant area index and crown vigour. The results also suggest that such an index could be used in conjunction with remotely sensed data to estimate stand condition across large areas.

Souter et al (2010) describe and trial a visual crown condition assessment method. Six of the eight crown variables are measured against each tree's assessable crown. The assessable crown (cf UN/ECE 2006) is the crown that is, or was, supported by all existing tree branches whether alive or dead.

Large-scale canopy or vegetation changes may be most efficiently captured by remotely sensed data. For example, Cunningham et al (2009a) describe an approach for mapping vegetation condition across a major river system and use RRG in the Murray as a test case. Wen et al (2009) used CART and API to assess the hydrological requirements of RRG.

3.1.5 Similar Systems

Considerable relevant work has been performed in the Pacific Northwest of the USA, where the principles and practice of ecological forest management have been developed for some time.

Carey et al (1999) describe different management approaches simulated in the PNW. Powell (1990) suggests stocking levels for management, based in the same region. Carey (2000) reports the effects of forest management strategies on squirrels. Thysell and Carey (2001) describe effects of density manipulation of Douglas-fir upon under storey communities.

Comparable work has been performed in other areas within Australia. Craig and Roberts (2005) focus on the short-term impacts of logging on the jarrah forest avifauna in south–west Western Australia. Bennett and Adams (2004a) measured the frequency of approaches, and also design and statistical issues, in assessments of harvesting effects on three response variables (tree regeneration, vertebrates and water) in two major native forests of south-east Australia. Neyland and LaScala (2005) report the response of understorey floristics to pre-commercial thinning and fertilising in even-aged eucalypt regeneration. Dwyer et al (2010) report the positive effects of restoration thinning in an Australian ecosystem. Bennett and Adams (2004b) produce a brief analysis of the quantification of research outputs for ecological effects of harvesting in Victoria's native forests. Kariuki (2008) reports response of tree survival and diameter growth to thinning treatments, using over 29 years in various thinning treatments established in a 21-year-old even-aged mixed-species regenerating forest in Victoria, Australia. Unfortunately, RRG was not included.

3.1.6 Ecological Thinning

Labarge et al (2009) describe an ecological thinning experiment. Cunningham et al (2009b) proposed ecological thinning trials for the Barmah region. Since European settlement, extensive river red gum regeneration has only been observed after the floods of the 1870s, 1956 and 1974/75. Curiously, dieback of river red gum even occurred in low-density stands under the current climate and flooding regimes.

Jactel et al (2009) assess the influences of forest stand management on biotic and abiotic risks of damage.

3.1.7 Precedents

Horner et al (2010) reported a long-term thinning study in the Barmah, established in 1965. The thinning trial was established in a dense, naturally regenerated forest, which was aged 26 years. The trial consisted of three replicate plots of three thinning treatments: 270, 560 and 750 trees ha^{-1} (residual densities) as well as three replicate unthinned plots, with ~4000 trees ha^{-1}. Thinning improved habitat value by producing 20 (+/-8) hollow-bearing trees per ha after 42 years, while the unthinned treatment produced none.

Gibbons et al. (2010) undertook a substantial hollow-recruitment modelling exercise for *E. fastigata* and *E. obliqua*. Their results indicated that trees with hollows can only be perpetuated

in harvested stands over multiple harvesting rotations if ≥2 recruitment trees are retained for each hollow-bearing tree and measures are employed to minimise mortality among all retained trees.

3.2 STATISTICAL ANALYSIS

A reasonable amount of RRG permanent plot data was available from Tim O'Kelly (OEH). These data were used for analysis in order to try to predict the likely effect of the treatments upon diameter growth, and the natural variability of that growth. These data are observational and do not involve intervention, so formal analysis would be misleading, but graphical summaries can be informative to get a sense of the likely magnitude of variation.

Figure 1 provides a visual summary of the annual diameter growth of the permanent plot data, classified by site quality (2 levels, 1 is highest) and crown class (3 levels; 1 is highest). The definition of crown class is as follows, taken from Anonymous (2001).

- Good crown: Well shaped vigorous crown, obviously expanding; mainly primary crown; few, if any, dead branches and no mistletoe.

- Fair crown: Crown neither well shaped nor vigorous, nor could it be called deformed or badly balanced. Mainly primary crown, not vigorous in appearance but with crown expansion taking place. Some dead branches, or branchlets, and a minor incidence of mistletoe may be accepted.

- Poor crown: A deformed or unbalanced crown; low crown density and not vigorous; not expanding and apparently incapable of expansion. Mainly secondary crown; dead branches common; mistletoe may be present. All suppressed trees have poor crown

The poorest site quality (SQ: 3) has been omitted due to its comprising a small number of observations. This figure shows that we can expect to observe different growth rates by treatment, but the rates won't be particularly large, and nor will the differences. These average growth rates range up to about 0.5 cm per year, but are mainly around half that, and can be very small. These data broadly reflect the published growth rates of RRG.

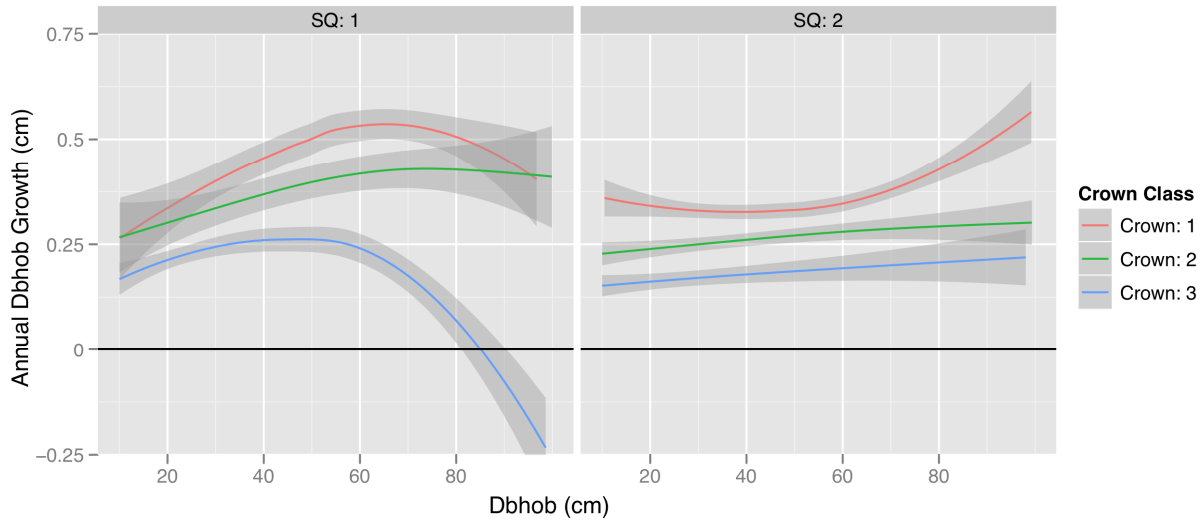


Figure 1: Smoothed annual growth trajectories for permanent plot observations of RRG, classified by site quality (2 levels, 1 is highest) and crown class (3 levels, 1 is highest), and including only trees < 100 cm dbhob. The shaded regions represent the standard errors of the smoothed lines.

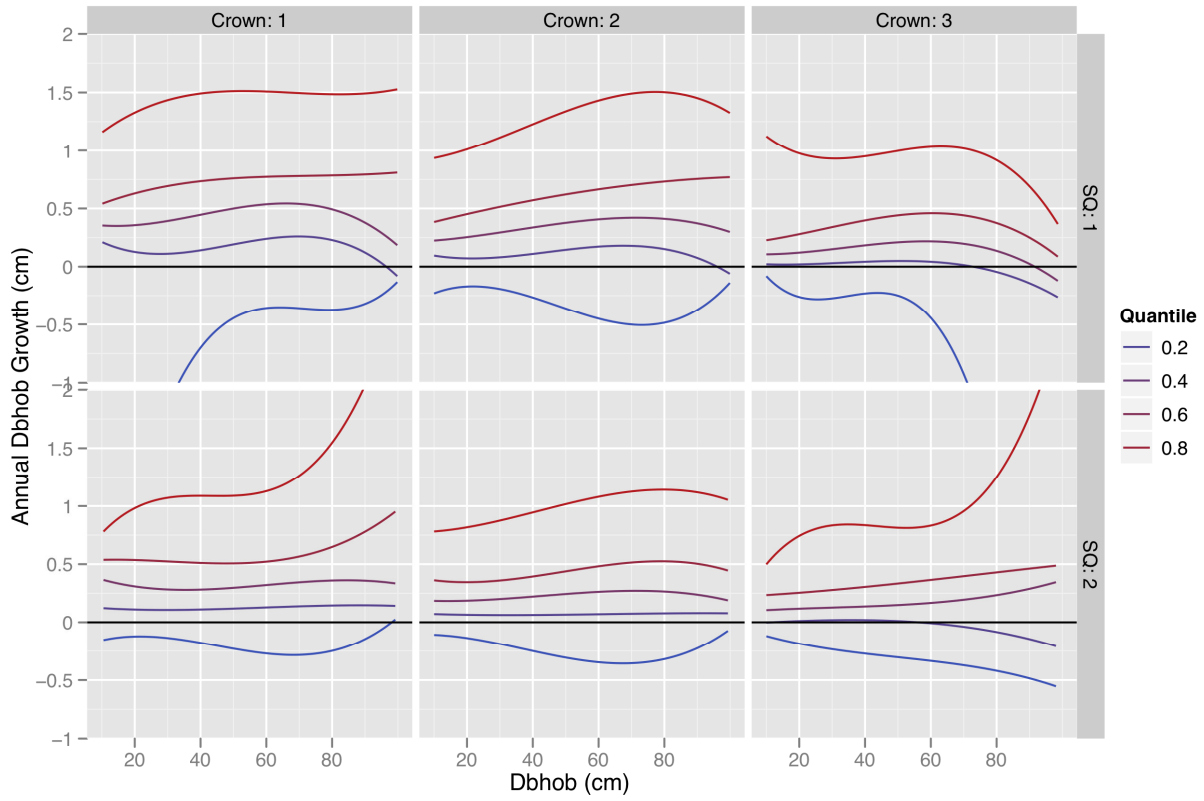


Figure 2: Smooth conditional quantiles (0.025, 0.25, 0.5, 0.75, 0.975) of observed annual growth against starting diameter, classified by site quality (2 levels, 1 is highest) and crown class (3 levels, 1 is highest), and including only trees < 100 cm dbhob.

The natural variability of the growth data is summarized in Figure 2. This graphic shows that the observed growth can vary substantially, with observations ranging from positive 2 cm per year to negative 1 cm per year. There is some pattern of variability in observed growth for trees between the different crown classes in site quality 1: crown class appears to positively affect diameter growth. The variability in observed growth for trees between the different crown classes in site quality 2 is negligible, apart from the growth of very large trees, Differences between the distributions of diameter growths seem obvious between site quality classes across crown classes.

3.3 DESIGN ANALYSIS

The plot-level analysis can proceed according to a relatively straightforward hierarchical ANOVA. In order to assess the suitability of the replication count, I constructed a skeleton analysis of variance (ANOVA) table, presented in Table 2. The purpose of this table is to assess the number of degrees of freedom that will be available to estimate key hypotheses.

Table 2: Analysis of variance (ANOVA) skeleton table showing degrees of freedom for different hypothesis tests for ecological thinning study design.

Term	ANOVA Degrees of Freedom
Density (3 levels)	3 – 1 = 2
Water Availability (2 levels)	2 – 1 = 1
Density * Water Availability	2 * 1 = 2
Site Error	19 Total – 2 – 1 – 2 = 14
Total	20 sites – 1 = 19
Thinning	3 – 1 = 2
Thinning * Density	2 * 2 = 4
Thinning * Water Availability	2 * 1 = 2
Thinning * Density * Water Availability	2 * 2 * 1 = 4
Plot Error	59 Total – 19 site df – 12 = 28
Total	59 = 60 plots – 1

I also developed a simple, ad-hoc power study for the change in individual tree measures based on estimates of variation that were identified in the literature review documented above, the permanent plot data, and some assumptions.

The purpose of the power study is not to provide a definitive judgment about the suitability of the design, but rather to permit an informal comparison of some design decisions. A number of arbitrary decisions were made in this power study, and it is a straightforward matter to run further analyses that are based on different assumptions, should they be deemed appropriate.

The informal power study for treatment effects upon 5-year individual tree diameter growth was based on simulations of the experiment with the following characteristics. I assumed a model for the 5-year diameter growth as follows:

$$g_{ij} = \frac{d_{ij}}{10} + m + s + t + b_i + e_{ij}$$

where

- *m* represents the moisture effect, and was 0.5 for moist sites and -0.5 for dry sites;
- *s* represents the stocking and was one of 0.5, 0, and -0.5 for light, medium, and heavy stocking respectively;
- *t* represents the treatment effect and was 0, 0.15, and 0.25 for the control, light, and heavy thinning treatments respectively,
- b_i was a normally-distributed site-specific growth adjustment, N(mean = 0, sd = 0.5); and
- e_{ij} was a normally-distributed site-specific tree error, N(mean = 0, sd = 1).

An example dataset is displayed in Figure 3. For these particular data, the simulation results suggest that the design is probably over-powered with 30 trees per plot and underpowered with 10 trees per plot for detecting a treatment effect of thinning upon tree diameter growth rates of 0.5 mm per annum.

The results of this study are provided in Table 3. The simulations show that, for the purposes of detecting a treatment effect of the magnitude simulated (details in Appendix), the balanced design is the most powerful, but is only slightly more powerful than the design recommended in this report. The proposed 30 measurement trees per plot should be more than sufficient, assuming that none are damaged or die during the experiment. A shorter remeasurement period than 5 years should be expected to yield less powerful results, because the reduced signal (one fifth of the time to grow) will be smaller relative to the fixed source of variation (measurement error and climatic variability).

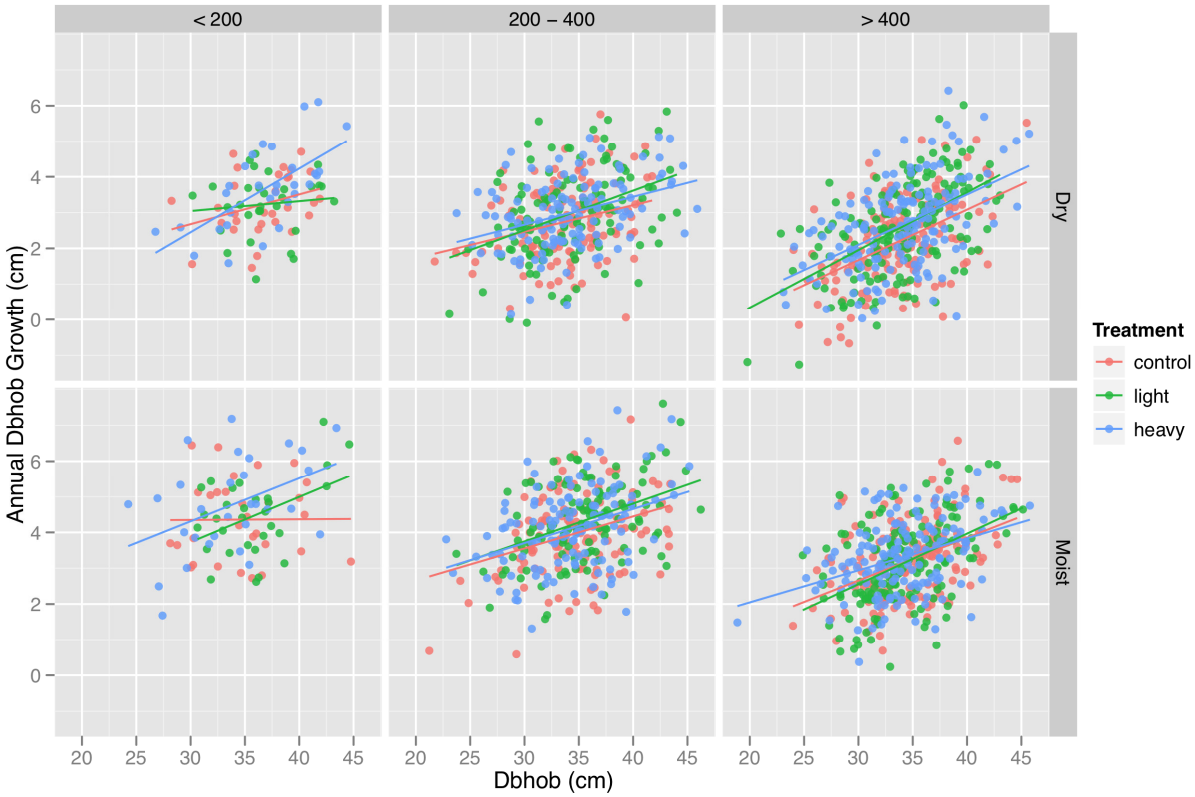


Figure 3: Example simulated growth data of the kind used for power study. The column headings refer to the initial stem densities, and the row labels refer to the moisture availability.

Table 3: Simulated probability of detecting a 0.25 mm per year treatment effect on diameter growth by design (row) and tree count (column), based on 10,000 randomly generated replicates and a 5-year growth period. The left-hand column reports the number of sites in each initial stem density class (Low, Medium, High) for each of the two site quality classes.

Design	10 Trees	20 Trees	30 Trees
1, 4, 5	0.612	0.897	0.981
2, 4, 5	0.646	0.928	0.988
3, 4, 5	0.691	0.946	0.994
4, 4, 4	0.690	0.949	0.994
3, 5, 5	0.729	0.962	0.996

3.4 Hypothesis Testing Considerations

This section contains a brief review of the statistical issues for the analysis of designed experiments that are intended to inform a decision, as opposed to create knowledge. My purpose is to sketch the conceptual framework that is necessary in order to answer the

statistical question of what size of test to use to analyze the data, where the size is defined as the probability of making a type-1 error. These terms will be explained shortly.

The analytical tool that will underpin the analysis of the data from this experiment is called a *hypothesis test*. Hypothesis tests are designed to measure the strength of evidence against a conjecture; the conjecture is called the null hypothesis. In an experiment such as this one the null hypothesis might be "that thinning has no effect or a negative effect on the diameter growth of all RRG". The alternative hypothesis would then be "that thinning has a positive effect on the diameter growth of at least some RRG".

Although they are phrased as statements of fact, the null and alternative hypotheses represent different management decisions: in the null case, ecological thinning would not be applied in the RRG system; in the alternative case ecological thinning could be applied in specific subsets of the system. This switch of hypotheses from statements of fact to decisions may be unfamiliar to students of introductory statistics but it is very important because it leads to the re-interpretation of statistical dogma. For example, in this setting the manager can, and well may, *accept the null hypothesis*. That is, the manager may decide not to perform ecological thinning anywhere in the RRG system. This is a key difference between tests that are used to make decisions and tests that are used to accumulate knowledge, in which accepting the null hypothesis is always a philosophical mistake.

So the challenge of interpretation comes down to deciding, before the experiment, what size the hypothesis tests will be. There is a lot of history behind the use of 0.05, and all of it is irrelevant. What matters is how the manager feels about the different kinds of mistakes that can be made, because that will guide how conservative she will be in interpreting the experimental outcome. Assuming that there is only one level of thinning, to simplify the presentation, very broadly speaking there are four outcomes:

1) Thinning is not needed, or could be detrimental, and is not performed.
2) Thinning would be beneficial, or is needed, and is performed.
3) Thinning is not needed, or could be detrimental, and is performed (Type-1 error)
4) Thinning would be beneficial, and is not performed (Type-2 error).

Given that such a decision needs to be made, there are two main errors that could be made: a type-1 error is made when thinning is performed although it is deleterious or useless (outcome 3), and a type-2 error is made when thinning is not performed although it would have been useful (outcome 4). A key decision of experimental design is determining which of these errors is the worse kind, and therefore what the *size* of the experiment will be, where the size is the name given to the designed probability of making a type-1 error.

This issue was raised and discussed during a conference call with Patrick Pigott (PV), Paul Childs, Emma Gorrod, Tim O'Kelly, David Keith, and Michael Pennay (all of OEH). The group consensus was that it would be worse to thin unnecessarily than to fail to thin if thinning assisted. This judgment suggests that an experimental size of 0.05 or smaller will be appropriate for the future analysis.

4. ASSESSMENT

4.1 STRENGTHS

The available literature makes plain that ecological thinning will very likely but not necessarily achieve the intended goals of increasing diameter growth rates of retained trees, and promoting development of hollow bearing trees. Hence, the outcome of the experiment is hard to predict. This uncertainty is a considerable strength of the experiment.

The design has the big picture correct. The design encompasses five key characteristics of well-designed experiments:

- comparison (several levels of a treatment, including a control),
- control of variation (use of blocking),
- randomization,
- replication, and
- balance (some).

The balance is not complete across all levels of the factors but there is good reason for this; the effect of thinning in low-density stands is likely to be negligible, and there is great interest in identifying if there is a threshold at which thinning does make a difference. Overall the design follows very sound experimental principles, although some recommendations are made for improvement below.

The design incorporates variability in space and time with an impressively detailed collection of monitoring variables that are tightly linked to the motivating hypotheses. These variables occupy a gradient of spatial and temporal detail that appropriately reflects the likely time and spatial scale needed to detect the treatment effect. Section 3 is particularly strong in this regard.

The design structure and extent reflects the likely considerable ecological variation that will be encompassed in the experiment. Replication and blocking have been used correctly to accommodate specific source of anticipated variation.

4.2 WEAKNESSES

The fixed-area monitoring subplot will not encompass enough trees in the heavy-thinning treatment (44 sph leads to a 0.25 ha plot with 11 stems, on average). The plot should be resized by according to the prescribed thinning intensity to encompass an approximately constant number of trees.

The small number of replicates for the low stocked stands is a concern for two reasons. Firstly, it assumes that thinning in low-stocked stands is unlikely to affect growth and therefore hollow-bearing recruitment. This may be reasonable for the lighter thinning treatment, but seems to be an unreasonable assumption for the heavy thinning treatment (to 44 sph). Also, including only one replicate in each level of inundation is risky because of the possibility of natural disturbance. Even though there is not presently a budget for long-term monitoring of these plots, it is not impossible that they may be remeasured in decades to come. Elimination by natural disturbance of either of the sole experimental units that represent the condition would lead to a weakened experiment and a wasted opportunity.

Tree diameter is likely to be the easiest of all the proposed ecosystem characteristics to measure reliably. However, measurement error for tree diameter is known to be substantial, even with well-trained crews (Omule 1980, Melson et al. 2009, Kitahara et al. 2010).

The design prescribes up to a specific quantity of downed wood to be left as detritus. It is not clear that the felled trees will necessarily provide sufficient material for all treatments. This aspect should be reconsidered.

4.3 OPPORTUNITIES

The fixed-area monitoring subplot should be stem-mapped by GPS to allow the construction of density-dependent individual tree growth response models with the remeasurement data. The informal power study suggests that 10 stem-mapped trees per plot would probably be too few; a count of 20 seems to be safer, and the design-specified 30 trees per plot may be more then necessary for detecting the effects of thinning upon diameter growth. However, higher numbers of trees measured will also ease detection of effects upon mortality rates, which are notoriously variable.

A pre-treatment measure of local competition for the retained trees would be very useful. It would be best if all the trees on the sub-plots were stem mapped and measured for diameter and height before the treatment but that may be infeasible in the high starting density sites. For example to end up with 20 trees in a plot that is assigned to the heavy thinning treatment would require about a 0.5 ha permanent monitoring subplot, which could translate to a requirement of the stem mapping of 200-300 stems for each plot, which is in round figures up to 600-900 stems per site.

4.4 THREATS

As noted above, including only one replicate in each level of inundation is risky because of the possibility of natural disturbance. Elimination by natural disturbance of either of the sole experimental units that represent the condition would lead to a weakened experiment and a wasted opportunity.

It is difficult to comment fully on the feasibility of the implementing the design using the information that is available at present. Usually the challenge with landscape-level experiments is situating the experiment on the landscape. Choosing locations for treatment units may well require a compromise in the number, shape, and size of the units.

The experimental population straddles a state border that is also a major river, between NSW and Victoria. Ordinarily political boundaries are not relevant to experimental boundaries, however, in this case the boundaries may reflect differing definitions of stratifying variables, and treatment histories, and there is concern that the states may also implement the treatments slightly differently. This observation raises several concerns. First, the experimental design should be as balanced as possible across the state boundary. It would be ideal if the design were exactly replicated in each state, but this is not essential. Certainly the design should strive to include adequate replication (say, two sites) of each combination of treatments within each state. Second, the treatment prescriptions should be as uniform as possible across the states.

5. RECOMMENDATIONS

1. The stated aims of the experiment do not marry entirely with the proposed hypotheses and tests. Based on conversations with the scientists, it seems that there is prior belief that different parts of the RRG forest will respond differently to the treatment, and this belief seems reasonable. Consequently, there is considerable interest in identifying which parts of the system are likely to benefit from the treatment, in the different effects of different treatment intensity upon the different parts of the forest, and in identifying the underlying similarities. The proposed experiment will make substantial progress towards this goal. The aims might be drafted to reflect this broader interest.

   It is my opinion that the aims of the experiment should be expressed as a hierarchy, as that structure accurately reflects the varying importance to the manager of different measurable effects of the treatments. However, I do not believe that the aims should specifically identify the variables of interest that will be measured. The identity and measurement protocols of those variables are both details of the experimental design. Example alternative wording is as follows.

The primary aim for the trial is to determine whether any of several levels of ecological thinning positively affect biodiversity and resilience to epidemic mortality within all or within specific strata of the RRG forests.

The secondary aim for the trial is to determine whether any of several levels of ecological thinning positively affect characteristics of the stands that are reasonably expected to lead to the primary aim, for example: hollow-bearing tree recruitment levels, understory species diversity, and stand-level canopy resilience to moisture stress (die-back).

The tertiary aim for the trial is to determine whether any of several levels of ecological thinning positively affect characteristics of the trees that are reasonably expected to lead to the secondary aim, for example: tree diameter growth rates, tree diameter distribution diversity, branch characteristics, and crown shape and health.

2. I recommend that the count of sites in low stem density be increased to *at least* two for each level of inundation. This boosting will increase the power of the design (as shown in power studies documented above), increase the precision with which the effect of thinning on low-density stands can be compared with higher-density stands, and finally increase the robustness of the design to external pressures such as insect attack and fire. The recommended pattern is presented in Table 4.

Table 4: Recommended count of blocks to be established within combinations of stocking density and site quality.

	Water Availability	
Stem density	**SQ1**	**SQ2**
<200	2	2
200-399	4	4
>400	5	5

3. The experimental design should be as balanced as possible across the state boundary. That is, the design should strive to include adequate replication (say, two sites) of each combination of treatments within each state, and the treatment prescriptions should be as uniform as possible across the states.

4. The treatment effect upon plot-level crown characteristics could possibly be inexpensively monitored using remotely-sense data, such as SPOT or MODIS. Jin and Sader (2005) and Eklundh et al. (2009) both report exercises in which MODIS data have been used to monitor response to disturbance. Analysis that follows a before-after, control-impact (BACI) design might be possible if the treatment units can be clearly

identified on the images before the treatments are applied. Such an analysis would be a more efficient use of measurement data than a direct control-treatment comparison.

5. The treatment effect upon tree-level crown characteristics could be inexpensively monitored using digital photographs taken from specified positions.

6. The quarter-hectare sub-plots for mature trees should be stem-mapped before and after treatment. The stem maps will enable various measures of inter-tree competition to be compared and applied during the analysis phase.

7. The post-treatment health of the remaining stems should be recorded, for example as damage class or health class. This recording will assist in identifying trees that die owing to mechanical damage rather than natural effects.

8. Some choice should be made about the size of the statistical tests that will be used for the motivating hypotheses. The size should reflect the decisions that will be determined using information that arises from the experiment. Discussions with the scientists by the author (AR) suggest that a size of 0.05 or smaller would be appropriate for this trial. Some position should be developed on this question as part of the experimental design.

9. When the data are collected, the analysis of the data should proceed at multiple levels. After the first remeasurement of the variables of interest, the difference between the characteristic of interest pre-treatment and post-treatment can be treated as a response variable. Response variables that are measured at the stand level, such as change in crown cover and change in PAI, should be analyzed based on the analysis of variance skeleton provided in Table 2, for example using R code similar to that supplied in Appendix 1. Variables that are measured at the tree level, such as diameter growth, branch spread, and crown length, should be analyzed using a response-surface approach. For example, measures of local stocking could be used to construct a model that predicts tree-specific response to thinning. Such a model could be used to try to identify a threshold initial density below which thinning has negligible effect. These models will need to be mixed-effects models (see e.g., Robinson and Hamann 2011) and may be constructed using R code similar to that supplied in Appendix 1. As the design ages, further remeasurements will be taken, which will be structured as a longitudinal study. In such cases, analysis using a mixed-effects model will be easier than using analysis of variance for both the stand-level and the tree-level response variables.

6. CONCLUSION

Overall the design is sound and fit for purpose, conditional on the recommendations in the previous section.

7. LITERATURE CITED

Anonymous. 2001. Native eucalypt forest permanent growth plot (PGP) establishment and measurement notes. Unpublished report.

Anonymous. 2011. Ecological Thinning Trial in NSW and Victorian River Red Gum Reserves. Unpublished draft.

Bacon, P.E., Stone, C., Binns, D.L., Leslie, D.J., and Edwards, D.W. 1993. Relationships between water availability and *Eucalyptus camaldulensis* growth in a riparian forest. *Journal of Hydrology*, 150 (2-4) 541-561.

Bennett, L.T., and Adams, M.A. 2004a. Assessment of ecological effects due to forest harvesting: approaches and statistical issues. *Journal of Applied Ecology,* 41 (4) 585-598

Bennett, L.T., and Adams, M.A. 2004b. Ecological effects of harvesting in Victoria's native forests: quantification of research outputs. *Australian Forestry,* 67: 212-221.

Bren, L. 1988. Effects of river regulation on flooding of a riparian red gum forest on the River Murray, Australia. Regulated Rivers: Research & Management 2(2) 65-77.

Carey, A.B., Lippke, B.R., and Sessions, J. 1999. Intentional systems management: managing forests for biodiversity. *Journal of Sustainable Forestry*, 9 (3/4): 83—119.

Carey, A.B. 2000. Effects of New Forest Management Strategies on Squirrel Populations. *Ecological Applications,* 10(1): 248-257.

Craig, M.D. and Roberts, J.D. 2005. The short-term impacts of logging on the jarrah forest avifauna in south-west Western Australia: implications for the design and analysis of logging experiments. *Biological Conservation* 124(2): 177-188.

Cunningham, S., Read, J., Baker, P.J., and Mac Nally, R. 2007. Quantitative assessment of stand condition and its relationship to physiological stress in stands of *Eucalyptus camaldulensis* (Myrtaceae). *Australian Journal of Botany*, 55 (7) 692-699.

Cunningham, S., Mac Nally, R., Read, J., Baker, P.J., White, M., Thomson, J., and Griffioen, P. 2009a. A Robust Technique for Mapping Vegetation Condition Across a Major River System. *Ecosystems*, 12(2): 207-219

Cunningham, S., Baker, P.J., and Horner, G. 2009b. Proposed Ecological Thinning Trials for River Red Gum Forests of the Middle Murray River Floodplain in Victoria. 30 p.

Cunningham, S., Thomson, J., Baker, P.J., Read, J., and Mac Nally, R. 2010. Does stand structure influence susceptibility of eucalypt floodplain forests to dieback? *Austral Ecology.* 35(3): 348-356.

Cunningham, S., Thomson, J., Mac Nally, R., Read, J., and Baker, P.J. 2011. Groundwater change forecasts widespread forest dieback across an extensive floodplain system. *Freshwater Biology*. 56(8): 1494-1508.

Dwyer, J.M., Fensham, R., and Buckley, Y.M. 2010. Restoration thinning accelerates structural development and carbon sequestration in an endangered Australian ecosystem. *Journal of Applied Ecology*. 47(3): 681-691.

Eklundh, L., Johansson T, and Solberg, S. 2009. Mapping insect defoliation in Scots pine with MODIS time-series data. *Remote Sensing of Environment* 113(7) 1566-1573

Gibbons, P. and Lindenmayer, D. 1996. Issues associated with the retention of hollow-bearing trees within eucalypt forests managed for wood production. *Forest Ecology and Management* 83(3): 245-279.

Gibbons, P., McElhinny, C., and Lindenmayer, D. 2010. What strategies are effective for perpetuating structures provided by old trees in harvested forests? A case study on trees with hollows in south-eastern Australia. *Forest Ecology and Management,* 260(6) 975-982

Halpern, C.B., and Spies, T. 1995. Plant species diversity in natural and managed forests of the Pacific Northwest. *Ecological Applications,* 5(4) 913-934.

Horner, G., Baker, P.J., Mac Nally, R., Cunningham, S., Thomson, J., and Hamilton, F. 2009. Mortality of developing floodplain forests subjected to a drying climate and water extraction. *Global Change Biology*, 15(9): 2176-2186.

Horner, G., Baker, P.J., Mac Nally, R., Cunningham, S., Thomson, J., and Hamilton, F. Forest structure, habitat and carbon benefits from thinning floodplain forests: Managing early stand density makes a difference. *Forest Ecology and Management,* 259 (3) 286-293

Jactel, H, and many others. 2009. The influences of forest stand management on biotic and abiotic risks of damage. *Ann. For. Sci.* 66 (7) 18 p.

Jin, S.M. and Sader, S.A. 2005. MODIS time-series imagery for forest disturbance detection and quantification of patch size effects. *Remote Sensing of Environment*, 99(4), 462-470.

Kariuki, M. 2008. Modelling the impacts of various thinning intensities on tree growth and survival in a mixed species eucalypt forest in central Gippsland, Victoria, Australia. *Forest Ecology and Management*, 256(12): 2007-2017.

Kitahara F., Mizoue, N., and Yoshida, S. 2010. Effects of training for inexperienced surveyors on data quality of tree diameter and height measurements. *Silva Fennica*, 44(4) 657-667

LaBarge, A., and Gersonde, R. 2009. Restoration thinning Cedar River exptl design monitoring. 10 p.

Mac Nally, R., Cunningham, S.C., Baker, P.J., Horner, G.J., and Thomson, J.R. 2011. Dynamics of Murray-Darling floodplain forests under multiple stressors: The past, present, and future of an Australian icon. *Water Resour. Res*. (47) 1-11.

Melson, S., Azuma, D., and Fried, J.S. 2009. A first look at measurement error on FIA plots using blind plots in the Pacific Northwest. Proceedings of the Third Annual Forest Inventory and Analysis Symposium, Traverse City, Michigan October 17-19, 2001 p 11-20.

Neyland, M.G., and LaSala, A.V. 2005. Response of understorey floristics to pre-commercial thinning and fertilising in even-aged eucalypt regeneration. *Tasforests*, 16: 71-82.

Omule, A.Y. 1980. Personal bias in forest measurements. For. Chron. 56(5): 222-224.

Opie, J.E. 1969. Predictability of individual tree growth using various definitions of competing basal area. *For. Sci.*, 14: 314-323.

Powell, D.C. 1999. Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest. 81 p.

Robinson, A.P., and Hamann, J.D. 2011. Forest Analytics with R. Springer.

Robinson, W.D., and Robinson S.K. 1999. Effects of selective logging on forest bird populations in a fragmented landscape. *Conservation Biology*, 13(1): 58-66.

Schonau, A.P.G, and Coetzee, J. 1989. Initial spacing, stand density and thinning in eucalypt plantations. *Forest Ecology and Management*. 29(4): 245-266.

Souter, N.J., Cunningham, S., Little, S., Wallace, T., McCarthy, B, and Henderson, M. 2010. Evaluation of a visual assessment method for tree condition of eucalypt floodplain forests. *Ecological Management & Restoration,* 11 (3) pp. 210-214.

Thomson, J., Horrocks, G., Cunningham, S., and Mac Nally, R .2009. Modelling Tree Hollow Availability Over Time in the Barmah Landscape Zone. A Report to the Goulburn-Broken CMA. 37 p.

Thysell, D.R., and Carey, A.B. 2001. Manipulation of density of *Pseudotsuga menziesii* canopies: preliminary effects on understory vegetation. *Can. J. For. Res*., 31: 1513-1525.

Wen, L., Ling, J., Saintilan, N., and Rogers, K. 2009. An investigation of the hydrological requirements of River Red Gum (*Eucalyptus camaldulensis*) Forest, using Classification and Regression Tree modelling. *Ecohydrology*. 2(2):143-155.

Wilson, S.M., and Carey, A.B. 2000. Legacy Retention Versus Thinning: Influences on Small Mammals. *Northwest Science,* 74 (2) 131-145.

8. APPENDIX I – R CODE

```
##############################################################################
#
# Simulation experiment that combines simple growth model assumptions with
# educated guesses at components of variation.
#
# Andrew Robinson 14/11/2011
#
##############################################################################

library(nlme)
library(doMC)
registerDoMC(6)

rep.exp <- function(stockings, trees.n, reps) {
  site.n <- sum(sapply(stockings, length))
  moisture <- list(dry = (1:(site.n/2))*2,
                   moist = (1:(site.n/2))*2-1)
  sites <- data.frame(site = factor(1:site.n))
  sites$moisture <- "Dry"
  sites$moisture[moisture$moist] <- "Moist"
  sites$moisture <- factor(sites$moisture, levels=c("Dry","Moist"))
  sites$stocking <- "< 200"
  sites$stocking[stockings$medium] <- "200 - 400"
  sites$stocking[stockings$heavy] <- "> 400"
  sites$stocking <- factor(sites$stocking, levels=c("< 200","200 - 400","> 400"))
  trts <- c("control","light","heavy")
  base <- expand.grid(site = factor(1:site.n),
                      Treatment = factor(trts, levels = trts),
                      tree = 1:trees.n)
  base <- merge(base, sites)
  sims <-
    foreach(j = 1:reps,
            .combine = rbind) %dopar% {
              base$dbh <-
                35 +
                  c(-1, 1)[base$moisture] +
                    c(1, 0, -1)[base$stocking] +
                      rnorm(site.n, mean = 0, sd = 2)[base$site] +
                        rnorm(nrow(base), mean = 0, sd = 4)
              base$dg <-
                base$dbh / 10 +
                  c(-0.5, 0.5)[base$moisture] +  # 2 mm p.a. moisture
                    c(0.5, 0, -0.5)[base$stocking] + # 2 mm p.a. stocking
                      c(0, 0.15, 0.25)[base$Treatment] +  # Treatment effect
                        rnorm(site.n, mean = 0, sd = 0.5)[base$site] + # Site
                          rnorm(nrow(base), mean = 0, sd = 1)  # Measurement
              test.model <- lme(dg ~ dbh + Treatment * stocking * moisture,
```

```
                                random = ~ 1 | site,
                                data = base)
              anova(test.model)[,4]
            }
  base$dbh <- 35 + rnorm(nrow(base))
  test.model <- lme(log(dbh) ~ dbh + Treatment * stocking * moisture,
                    random = ~ 1 | site,
                    data = base)
  colnames(sims) <- rownames(anova(test.model))
  return(as.data.frame(sims))
}

reps <- 10000

# 1, 4, 5,

stockings <- list(heavy = c(1:10),
                  medium = c(11:18),
                  light = c(19:20))

mean(rep.exp(stockings, trees.n = 10, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 20, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 30, reps = reps)$Treatment < 0.05)

# 2, 4, 5,

stockings <- list(heavy = c(1:10),
                  medium = c(11:18),
                  light = c(19:22))

mean(rep.exp(stockings, trees.n = 10, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 20, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 30, reps = reps)$Treatment < 0.05)

# 4, 4, 4,

stockings <- list(heavy = c(1:8),
                  medium = c(9:16),
                  light = c(17:24))

mean(rep.exp(stockings, trees.n = 10, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 20, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 30, reps = reps)$Treatment < 0.05)

# 3, 4, 5,

stockings <- list(heavy = c(1:10),
                  medium = c(11:18),
                  light = c(19:24))
```



```
mean(rep.exp(stockings, trees.n = 10, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 20, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 30, reps = reps)$Treatment < 0.05)

# 3, 5, 5,

stockings <- list(heavy = c(1:10),
                  medium = c(11:20),
                  light = c(21:26))

mean(rep.exp(stockings, trees.n = 10, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 20, reps = reps)$Treatment < 0.05)
mean(rep.exp(stockings, trees.n = 30, reps = reps)$Treatment < 0.05)
```



```
#############################################################################
#
# Trial runs with various functions for data analysis
#
# Andrew Robinson 14/11/2011
#
#############################################################################

et.sites <- expand.grid(density = c("<200","200--400",">400"),
                        propensity = c("Low","High"))

treatment <- c("Control","Light Thin","Heavy Thin")

allocation <- rep(c(1,4,5),2)

et.sites <- et.sites[rep(1:length(allocation),allocation*length(treatment)),]

et.sites$treatment <- factor(rep(treatment, nrow(et.sites) / length(treatment)))

et.sites$site <- factor(rep(1:sum(allocation), each = 3))

et.sites$y <- rnorm(n = nrow(et.sites))

et.anova <- aov(y ~ treatment * density * propensity + Error(site), data = et.sites)

et.anova ## Complains about effects not estimable regardless of balance.

summary(et.anova)

library(nlme)

et.lme <- lme(y ~ treatment * density * propensity,
              random = ~ 1 | site,
              data = et.sites)

anova(et.lme) ## Num and Den DF are identical to et.anova.

library(lme4)

et.lmer <- lmer(y ~ treatment * density * propensity + (1 | site),
                data = et.sites)

anova(et.lmer)

## SS and MS are identical to et.anova, and F is also when the effects are balanced.
```


Appendix 7 – Risk assessment for Environment Protection and Biodiversity Conservation Act 1999-listed matters of national environmental significance with a moderate or greater likelihood of occurrence in the trial area

No	Project phase	Project activity	Potential impact pathway	Areas affected				Initial Risk			Management controls	Residual Risk		
				Control	Mod. thinning	Heavy thinning	Ancillary	Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
	Cattle Egret (*Area ibis*)													
1	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
2	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
3	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
4	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
5	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
6	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
7	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
8	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
9	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
10	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
11	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible

12	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
13	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	1	Negligible
14	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
15	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
16	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
17	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
18	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	2	2	Low
19	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
20	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
21	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
22	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible

23	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
24	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
25	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	3	1	Negligible
26	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
27	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
28	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
29	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
30	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
31	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
32	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
33	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
34	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
35	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low

36	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
37	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
38	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
39	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		2	2	Low	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
40	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
41	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
42	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
43	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
44	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
45	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
46	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
47	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
48	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	4	1	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
49	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low

50	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
51	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
52	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
53	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
54	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
55	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	2	1	Negligible
	Eastern Great Egret (*Area modesta*)													
56	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
57	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
58	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
59	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
60	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
61	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible

62	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
63	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
64	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
65	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
66	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
67	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
68	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	1	Negligible
69	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
70	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
71	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
72	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low

73	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	2	2	Low
74	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
75	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
76	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
77	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
78	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
79	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
80	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	3	1	Negligible
81	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
82	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
83	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
84	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible

85	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
86	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
87	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
88	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
89	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
90	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
91	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. Applicable to most bird species (not really a mitigation measure, but a justification of low initial risk): The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
92	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
93	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
94	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		2	2	Low	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
95	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
96	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
97	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
98	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible

99	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
100	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
101	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
102	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. Applicable to most bird species (not really a mitigation measure, but a justification of low initial risk): The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
103	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	4	1	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
104	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
105	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
106	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
107	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
108	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
109	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
110	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	Fork-tailed Swift (*Apus pacificus*)													

111	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
112	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
113	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
114	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
115	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
116	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
117	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
118	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
119	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
120	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
121	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
122	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible

123	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
124	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
125	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
126	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
127	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
128	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
129	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	1	Negligible
130	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
131	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
132	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
133	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible

134	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of the felling activities avoids when this species is in the area. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
135	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	1	Negligible
136	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. Applicable to most bird species (not really a mitigation measure, but a justification of low initial risk): The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
137	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
138	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
139	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
140	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
141	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
142	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	2	2	Low	All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
143	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
144	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
145	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
146	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible

147	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	1	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
148	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
149	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
150	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	Rainbow Bee-eater (*Merops ornatus*)													
151	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
152	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
153	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
154	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
155	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
156	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
157	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
158	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
159	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible

160	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
161	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
162	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
163	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	1	Negligible
164	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
165	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
166	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
167	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
168	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
169	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
170	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible

171	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
172	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
173	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
174	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
175	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	3	1	Negligible
176	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
177	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
178	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
179	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
180	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
181	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
182	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The timing of the felling activities avoids the breeding season of this species. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	3	Medium

183	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
184	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
185	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
186	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
187	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
188	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
189	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
190	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
191	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
192	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	4	3	High	All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
193	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
194	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
195	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
196	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
197	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible

198	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
199	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
200	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
201	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
202	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
203	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
204	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	Superb Parrot (*Polytelis swainsonii*)													
205	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
206	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
207	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
208	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
209	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible

210	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
211	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
212	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
213	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
214	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	4	3	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
215	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
216	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
217	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
218	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
219	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	4	2	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	3	2	Low
220	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible

221	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
222	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
223	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
224	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
225	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	1	Negligible
226	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
227	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
228	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
229	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
230	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
231	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible

232	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	3	3	Medium
233	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
234	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
235	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
236	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	3	3	Medium
237	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
238	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
239	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
240	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
241	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	3	2	Low
242	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible
243	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		3	2	Low	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
244	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
245	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible

246	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	3	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
247	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
248	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
249	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
250	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
251	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	1	Negligible
252	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible
253	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
254	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
255	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
256	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
257	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible

258	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
259	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	White-bellied Sea Eagle (*Haliaeetus leucogaster*)														
260	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
261	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
262	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
263	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
264	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
265	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
266	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
267	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
268	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
269	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible

270	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
271	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
272	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
273	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
274	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
275	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
276	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
277	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
278	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
279	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
280	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible

281	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
282	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
283	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
284	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
285	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
286	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
287	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
288	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
289	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
290	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
291	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
292	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
293	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible

294	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
295	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
296	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
297	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
298	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
299	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
300	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
301	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
302	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal		✓	✓	✓	1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
303	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic		✓	✓	✓	1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
304	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
305	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
306	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓	✓	3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
307	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible

308	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
309	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
310	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
311	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
312	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
313	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	White-throated Needletail (*Hirundapus caudacutus*)													
314	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
315	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
316	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
317	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
318	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
319	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible

320	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
321	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
322	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
323	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
324	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
325	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
326	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
327	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
328	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of the felling activities avoids when this species is in the area. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
329	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
330	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
331	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible

332	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
333	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	2	Low	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	2	Negligible
334	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
335	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads		✓	✓	✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
336	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise		✓	✓	✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
337	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓	✓	2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
338	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material	✓	✓	✓	✓	1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
339	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment	✓	✓	✓	✓	2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
340	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
	Murray Hardyhead (*Craterocephalus fluviatilis*)													
341	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
342	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
343	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible

344	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
345	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
346	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
347	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
348	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
349	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
350	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
351	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
352	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
353	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
354	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
355	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible

356	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
357	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
358	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
359	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
360	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
361	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
362	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
363	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
364	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
365	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
366	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
367	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	1	Negligible	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible

368	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
369	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
370	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
371	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	1	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
372	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
373	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
374	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
375	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		2	4	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
376	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
377	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
378	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
379	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		2	3	Medium	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
380	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
381	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		1	1	Negligible	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	1	Negligible

382	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	1	1	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
383	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
384	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal					1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
385	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic				✓	1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
386	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
387	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise				✓	1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
388	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
389	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
390	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	1	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
391	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	1	1	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
392	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
393	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low

394	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
395	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	1	Negligible
	South-eastern Long-eared Bat (*Nyctophilus corbeni*)														
396	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
397	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
398	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
399	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
400	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
401	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
402	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
403	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
404	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
405	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low

406	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
407	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
408	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
409	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
410	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
411	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
412	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
413	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
414	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
415	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
416	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible

417	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
418	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
419	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
420	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
421	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
422	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
423	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		3	4	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	4	Medium
424	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
425	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
426	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	2	Negligible	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
427	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	3	3	Medium
428	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
429	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low

430	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
431	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
432	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
433	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
434	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
435	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
436	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
437	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
438	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal					1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
439	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic				✓	2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	2	2	Low
440	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
441	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise				✓	2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
442	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
443	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low

444	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fireintensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
445	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
446	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
447	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		1	2	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
448	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
449	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		1	3	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	Koala (*Phascolarctos cinereus*)														
450	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
451	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
452	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
453	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	1	Negligible
454	Establishment	Maintenance of formal access roads	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
455	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
456	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible

457	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
458	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
459	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	4	3	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
460	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
461	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
462	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	1	Negligible
463	Establishment	Establishment of natural surface tracks	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
464	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
465	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible
466	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
467	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low

468	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
469	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
470	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
471	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
472	Establishment	Maintenance of stockpile sites	Potential impact on species lifecycle due to increased noise				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
473	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
474	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
475	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	1	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
476	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
477	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	3	Medium
478	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
479	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible

480	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
481	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	3	Medium
482	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		4	3	High	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	3	Medium
483	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
484	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
485	Treatment	Felling	Potential impact on species lifecycle due to increased noise		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
486	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		4	2	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	3	2	Low
487	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible
488	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
489	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
490	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
491	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
492	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal					3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium

493	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
494	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
495	Treatment	Transportation and storage of excess felled material	Potential impact on species lifecycle or movement due to increased noise				✓	2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. The proposed timing of felling activities avoids the breeding period for this species. The species is highly mobile, and is expected to relocate to other suitable habitat if disturbed by noise. All machinery will be fitted with appropriate mufflers to minimise noise, and will be regularly serviced. Daily pre-start checks will be conducted to identify any machinery faults. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
496	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	1	Negligible
497	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	2	2	Low
498	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
499	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
500	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	1	Negligible
501	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		1	1	Negligible	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	1	Negligible
502	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
503	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	River Swamp Wallaby-grass (*Amphibromus fluitans*)													
504	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low

505	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
506	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
507	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	4	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	4	Medium
508	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
509	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
510	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
511	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
512	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
513	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
514	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
515	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	4	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	4	Medium

516	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
517	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
518	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
519	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
520	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
521	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
522	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
523	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
524	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
525	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
526	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low

527	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
528	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify individual(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
529	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
530	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		2	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
531	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
532	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action, The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
533	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
534	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
535	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	4	High	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	4	Medium
536	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
537	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
538	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		3	3	Medium	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
539	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
540	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low

541	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
542	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
543	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal					3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
544	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
545	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	3	4	High	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	4	Medium
546	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
547	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	3	Medium	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
548	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
549	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
550	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
551	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
552	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible

553	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	Mueller Daisy (*Brachyscome muelleroides*)													
554	Establishment	Maintenance of formal access roads	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
555	Establishment	Maintenance of formal access roads	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
556	Establishment	Maintenance of formal access roads	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
557	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
558	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
559	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
560	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
561	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
562	Establishment	Establishment of natural surface tracks	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
563	Establishment	Establishment of natural surface tracks	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
564	Establishment	Establishment of natural surface tracks	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low

565	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
566	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
567	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
568	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
569	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
570	Establishment	Maintenance of stockpile sites	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
571	Establishment	Maintenance of stockpile sites	Potential direct impact on species from removal of native vegetation				✓	3	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
572	Establishment	Maintenance of stockpile sites	Potential direct impact on species from increased vehicle traffic				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
573	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
574	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
575	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible

576	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
577	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
578	Treatment	Identification of trees for retention	Potential direct impact on species due to failure to identify habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
579	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
580	Treatment	Identification of trees for retention	Potential direct impact on species and/or habitat, such as through trampling		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
581	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
582	Treatment	Felling	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If this species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	3	Medium
583	Treatment	Felling	Potential direct impact on species due to tree felling		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
584	Treatment	Felling	Potential direct impact on species through increased vehicle or machinery traffic		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
585	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
586	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
587	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
588	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		3	3	Medium	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
589	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible

590	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
591	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
592	Treatment	Transportation and storage of excess felled material	Potential removal of, or damage to, known or previously unrecorded habitat feature(s)				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
593	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal					3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
594	Treatment	Transportation and storage of excess felled material	Potential direct impact on species from increased vehicle traffic				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this species is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
595	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	2	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
596	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
597	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Site selection avoided known occurrences of this species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this species was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
598	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
599	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
600	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species and/or habitat, such as through trampling	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
601	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low

602	Site monitoring	Conduct flora and fauna survey	Potential direct impact on species from increased vehicle traffic	✓	✓	✓		3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
603	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	Grey Box (Eucalyptus microcarpa) Grassy Woodlandsand Derived Native Gr										**s of South-eastern Australia**			
604	Establishment	Maintenance of formal access roads	Potential direct impact on the community from removal or damage				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
605	Establishment	Maintenance of formal access roads	Potential direct impact on the community from increased vehicle traffic				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this community is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the community and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
606	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site.	1	3	Low
607	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
608	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
609	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. All personnel must complete a project induction prior to commencing work on sites.	1	3	Low
610	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low

611	Establishment	Establishment of natural surface tracks	Potential direct impact on the community from removal or damage				✓	1	3	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
612	Establishment	Establishment of natural surface tracks	Potential direct impact on the community from increased vehicle traffic				✓	1	3	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this community is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the community and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
613	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	3	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction prior to commencing work on site.	1	3	Low
614	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	3	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
615	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	3	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
616	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	1	2	Negligible	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
617	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
618	Establishment	Maintenance of stockpile sites	Potential direct impact on community from removal or damage				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
619	Establishment	Maintenance of stockpile sites	Potential direct impact on the community from increased vehicle traffic				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this community is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the community and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low

620	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	1	3	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this community is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the community and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
621	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
622	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
623	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	1	2	Negligible	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
624	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
625	Treatment	Identification of trees for retention	Potential direct impact on the community due to failure to identify habitat feature(s)		✓	✓		1	3	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the community is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If the community is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the community is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
626	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		1	3	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
627	Treatment	Identification of trees for retention	Potential direct impact on the community and/or habitat, such as through trampling		✓	✓		3	2	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. Injury or death of all native fauna species are to be reported to the Project Manager immediately. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	1	Negligible
628	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible

629	Treatment	Felling	Potential direct impact on the community due to tree felling		✓	✓		1	3	Low	Site selection avoided known occurrences of this community. Further, if community was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
630	Treatment	Felling	Potential direct impact on the community through increased vehicle or machinery traffic		✓	✓		1	3	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
631	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		1	2	Negligible	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
632	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		1	3	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
633	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		1	2	Negligible	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
634	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		1	2	Negligible	Site selection avoided known occurrences of this community and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this community was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
635	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
636	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	2	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
637	Treatment	Transportation and storage of excess felled material	Potential direct impact on the community during coarse woody debris removal					1	2	Negligible	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible

638	Treatment	Transportation and storage of excess felled material	Potential direct impact on the community from increased vehicle traffic				✓	1	3	Low	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If this community is identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
639	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	1	3	Low	Site selection avoided known occurrences of this community and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this community was identified in a plot, it was assigned as a control plot. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site.	1	3	Low
640	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Site selection avoided known occurrences of this community. Further, if this community was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
641	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	2	3	Medium	Site selection avoided known occurrences of this community and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if this community was identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site.	1	3	Low
642	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
643	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	Barmah Forest Ramsar site														
644	Establishment	Maintenance of formal access roads	Potential impact from damage to, or removal of, native vegetation				✓	3	4	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
645	Establishment	Maintenance of formal access roads	Potential impact from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the listed species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
646	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
647	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
648	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low

649	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
650	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
651	Establishment	Establishment of natural surface tracks	Potential impact from damage to, or removal of, native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
652	Establishment	Establishment of natural surface tracks	Potential impact from increased vehicle traffic				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the listed species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
653	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
654	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
655	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
656	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
657	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
658	Establishment	Maintenance of stockpile sites	Potential impact from damage to, or removal of, native vegetation				✓	2	4	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
659	Establishment	Maintenance of stockpile sites	Potential impact from increased vehicle traffic				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible

660	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
661	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
662	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
663	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
664	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
665	Treatment	Identification of trees for retention	Potential direct impact due to failure to identify habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that listed species are not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by listed species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If listed species' potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
666	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
667	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
668	Treatment	Felling	Potential impact from damage to, or removal of, native vegetation		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If a species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
669	Treatment	Felling	Potential impact through increased vehicle or machinery traffic		✓	✓		2	3	Medium	Site selection avoided known occurrences of listed species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
670	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
671	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
672	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low

673	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		3	2	Low	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
674	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
675	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
676	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
677	Treatment	Transportation and storage of excess felled material	Potential impact from damage to, or removal of, native vegetation				✓	3	4	High	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
678	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal				✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
679	Treatment	Transportation and storage of excess felled material	Potential impact from increased vehicle traffic				✓	2	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
680	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	3	3	Medium	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
681	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
682	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
683	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
684	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
685	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible

686	Site monitoring	Conduct flora and fauna survey	Potential impact from increased vehicle traffic	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the listed species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
687	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
	NSW Central Murray State Forest (Millewa Precinct) Ramsar site														
688	Establishment	Maintenance of formal access roads	Potential impact from damage to, or removal of, native vegetation				✓	3	4	High	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
689	Establishment	Maintenance of formal access roads	Potential impact from increased vehicle traffic				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the listed species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
690	Establishment	Maintenance of formal access roads	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Where maintenance is required, it will be undertaken in accordance with existing park management procedures to mitigate the risk of erosion, runoff and sedimentation. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
691	Establishment	Maintenance of formal access roads	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
692	Establishment	Maintenance of formal access roads	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	3	Low
693	Establishment	Maintenance of formal access roads	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
694	Establishment	Maintenance of formal access roads	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
695	Establishment	Establishment of natural surface tracks	Potential impact from damage to, or removal of, native vegetation				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
696	Establishment	Establishment of natural surface tracks	Potential impact from increased vehicle traffic				✓	2	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). Widths for natural surface tracks will be limited to a maximum of x metres. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the listed species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low

697	Establishment	Establishment of natural surface tracks	Potential adverse water quality impact due to increased runoff/sedimentation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Routes for surface tracks will avoid drainage feature crossings. Widths for natural surface tracks will be limited to a maximum of 4 m. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
698	Establishment	Establishment of natural surface tracks	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Prior to establishment, all proposed natural surface track routes will be walked and surveyed for threatened species by a suitably qualified ecologist. Natural surface tracks established during the treatment phase will be closed immediately after treatment is completed. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Natural surface tracks will not be bladed off (i.e. stripped of ground layer vegetation to expose bare earth). If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. Widths for natural surface tracks will be limited to a maximum of 4 m. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
699	Establishment	Establishment of natural surface tracks	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	3	Medium	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
700	Establishment	Establishment of natural surface tracks	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails to minimise the need for establishment of additional natural surface tracks. Construction activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
701	Establishment	Establishment of natural surface tracks	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	2	Low	Sites are located greater than 100 m from the nearest road to minimise disturbance effects, and are near existing fire trails. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
702	Establishment	Maintenance of stockpile sites	Potential impact from damage to, or removal of, native vegetation				✓	2	4	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
703	Establishment	Maintenance of stockpile sites	Potential impact from increased vehicle traffic				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
704	Establishment	Maintenance of stockpile sites	Potential adverse water quality impact due to increased runoff/sedimentation				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	2	Negligible
705	Establishment	Maintenance of stockpile sites	Potential increase in edge effects and/or fragmentation due to removal of native vegetation				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. To avoid the need for removal of native vegetation due to road widening, vehicles will be of an appropriate size for existing park roads. For example, B-double vehicles, which would require road widening, will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	2	Negligible
706	Establishment	Maintenance of stockpile sites	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Maintenance activities will not be undertaken during or immediately after rainfall events, or where floodwater has encroached into a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles and machinery involved in the Project, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
707	Establishment	Maintenance of stockpile sites	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	2	2	Low	Stockpile sites make best use of the existing road network and are bounded by existing fencing infrastructure. No formal works will be required to establish these sites, minimising the risk of habitat disturbance. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible

708	Establishment	Maintenance of stockpile sites	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	2	3	Medium	Stockpile sites make best use of the existing road network and are located near existing fire trails. Where maintenance is required, it will be undertaken in accordance with existing park management procedures. Vehicles are to keep to formal access roads only, which will mitigate the risk of ignition. The proposed timing of activities falls outside the typical Fire Danger Period. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
709	Treatment	Identification of trees for retention	Potential direct impact due to failure to identify habitat feature(s)		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that listed species are not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by listed species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If listed species' potential habitat is abundant, plots containing such features will be assigned as the control plot. Injury or death of native fauna species are to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the species and the action taken. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
710	Treatment	Identification of trees for retention	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
711	Treatment	Identification of trees for retention	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment		✓	✓		2	2	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	2	Negligible
712	Treatment	Felling	Potential impact from damage to, or removal of, native vegetation		✓	✓		3	4	High	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A suitably qualified ecologist will identify trees for retention in accordance with the Tree Marking Manual, including: all Red River Gums which have a DBH>40cm; contain a visible hollow; or are dead trees with DBH>20cm, will be marked for retention with bright-coloured spray paint. This will occur no greater than 4 weeks prior to commencement of felling activities. In order to confirm that the species is not present during felling, an additional walk-through will be conducted by a suitably qualified ecologist immediately prior to commencement of the first day of felling operations. If habitat suspected of use by the species (e.g. nest site) is found to be present, a 40 m protective buffer will be applied, within which no thinning operations will occur. If the species potential habitat is abundant, plots containing such features will be assigned as the control plot. If a species is identified by the Contractor during felling activities, the threatened species contingency protocol will be followed, including immediately ceasing felling activities within 40 m of the species and immediately notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. The Project Manager will keep maintain a record of each occurrence of the species and the action taken. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	4	Medium
713	Treatment	Felling	Potential impact through increased vehicle or machinery traffic		✓	✓		2	3	Medium	Site selection avoided known occurrences of listed species. Further, if this species was identified in a plot, it was assigned as a control plot. A 50 km/h speed limit will apply on all park access roads. Vehicles are to keep to existing park access roads and established natural surface tracks. No vehicles other than those involved in felling will be permitted to enter treatment plots. Injury or death of native fauna species are to be immediately reported to the Project Manager. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	1	3	Low
714	Treatment	Felling	Potential adverse water quality impact due to increased runoff/sedimentation		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
715	Treatment	Felling	Potential impact on canopy connectivity due to removal of native vegetation		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Canopy condition data was used to inform the site selection process. It is the intent of the trial to facilitate a long-term improvement in canopy condition in the treatment plots. The total area of proposed treatment plots constitutes approximately 0.6% of National Park area. No impacts on canopy connectivity will occur outside these areas. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	3	Medium
716	Treatment	Felling	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement		✓	✓		3	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	3	Medium
717	Treatment	Felling	Potential impacts from off-target use of herbicide		✓	✓		3	3	Medium	Herbicide will be applied automatically by the tree harvesting machinery. The machinery is programmed to only apply the minimum required concentration of herbicide. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
718	Treatment	Felling	Potential impact on soil and/or waterways such as from vehicle or machinery spills		✓	✓		3	2	Low	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles ,vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
719	Treatment	Felling	Potential impact from increased fire intensity associated with increased coarse woody debris level		✓	✓		2	3	Medium	Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. Monitoring of these levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements.	1	3	Low
720	Treatment	Felling	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment		✓	✓	✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low

721	Treatment	Transportation and storage of excess felled material	Potential impact from damage to, or removal of, native vegetation				✓	3	4	High	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. To avoid removal of native vegetation, vehicles will be of a appropriate size so that additional widening of access roads will not be required. For example, B-double vehicles, which would require road widening will not be allowed on site. If any removal of native vegetation is required, a suitably qualified ecologist will assess this vegetation prior to removal. Any removal of native vegetation will be to the minimum extent necessary and in accordance with existing park management practices. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	1	3	Low
722	Treatment	Transportation and storage of excess felled material	Potential direct impact on species during coarse woody debris removal				✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. All coarse woody debris that exists within a treatment plot prior to the commencement of felling activities will not be disturbed, and will not be removed from the plot. Felled material will be removed to trucks using forwarders, which do not drag trees along the ground, thereby minimising impact to soils. Depending on site location and conditions, trees may be removed to temporary 'log landings' prior to loading onto trucks. Native vegetation will not be cleared to establish a log landing. All personnel must complete a project induction and be suitably qualified to undertake their work prior to commencing work on site.	2	2	Low
723	Treatment	Transportation and storage of excess felled material	Potential impact from increased vehicle traffic				✓	2	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will not travel at speeds greater than 50 km/h within the National Parks. If listed species are identified by the Contractor during maintenance activities, the contingency protocol will be followed, including immediately ceasing maintenance activities in the vicinity of the species and notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported immediately to the Project Manager. The Project Manager will maintain a record of all reports and actions. All personnel must complete a project induction which will include information on EPBC Act listed flora and fauna.	1	3	Low
724	Treatment	Transportation and storage of excess felled material	Potential adverse water quality impact due to runoff/sedimentation on park access roads				✓	3	3	Medium	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species was identified in a plot, it was assigned as a control plot. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. Transportation will not recommence until directed to do so by PV or OEH. Park road maintenance will be conducted by PV and OEH in accordance with existing park management practices. Contractors will cease transportation of excess felled material during or immediately following rainfall events, or where floodwater has encroached onto a site. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	3	Low
725	Treatment	Transportation and storage of excess felled material	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement				✓	3	2	Low	Site selection avoided known occurrences of this species. Further, if this species was identified in a plot, it was assigned as a control plot. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be cleaned using high-pressure water or compressed air prior to entering the National Parks. Prior to moving between sites, or exiting the National Parks, all machinery and equipment will be manually cleaned to remove dirt. Contractors will be required to keep a formal record of equipment clean downs undertaken. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	2	2	Low
726	Treatment	Transportation and storage of excess felled material	Potential impact on soil and/or waterways such as from vehicle or machinery spills				✓	3	2	Low	Site selection avoided known occurrences of listed species and that treatment and control plots are not located in, or within 50 m of, established wetlands. Further, if listed species were identified in a plot, it was assigned as a control plot. Contractors will cease felling activities during or immediately following rainfall events, or where floodwater has encroached onto a site. All plant and equipment will be maintained to limit risk of accidental spills. All refuelling will occur in designated bunded areas. Spill kits will be available in all vehicles, including mobile refuelling vehicles. Any spills (not only fuel) will be reported to the Project Manager. In the event of any spills, contaminated soils will be removed and disposed of at a landfill site in a manner consistent with the Environment Protection (Industrial Waste Resource) Regulations 2009 (Vic) or Protection of the Environment Operations (Waste) Regulation 2005 (NSW). All spills will be reported to the Project Manager. A minimum 50 m protection buffer from mapped waterways and wetlands. Additionally, a 20 m protection buffer will be established around unmapped drainage lines and waterways. All personnel must complete a project induction prior to commencing work on site, which will include information on waterway and wetland protection buffers.	1	2	Negligible
727	Treatment	Transportation and storage of excess felled material	Potential impact from increase fire intensity associated with excess felled material				✓	1	3	Low	The proposed timing of activities falls outside the typical Fire Danger Period. Coarse woody debris known not to increase fire intensity - fine fules do this. Contractors will ensure that coarse woody debris levels will not exceed a limit of 45-50 t/ha. The stockpile site has existing firebreaks in place. Monitoring of coarse woody debris levels will be undertaken to ensure compliance with this limit. All personnel must complete a project induction, which will include details of fire management requirements. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
728	Treatment	Transportation and storage of excess felled material	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles, machinery and equipment				✓	3	3	Medium	The proposed timing of activities falls outside the typical Fire Danger Period. Vehicles will keep to formal access roads in accordance with existing park management practices, which will reduce the risk of ignition. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. No fires will be lit on the site and littering of cigarette butts will not be permitted. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low
729	Site monitoring	Conduct flora and fauna survey	Potential spread of weeds and pathogens due to vehicle, equipment and/or pedestrian movement	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. Vehicles will be limited to existing park access roads. A weed and pathogen hygiene protocol will apply to all vehicles, equipment and personnel. All machinery will be fully cleaned using high-pressure water prior to entering the National Parks. Machinery will receive a manual clean-down when moving between treatment plots and prior to leaving the National Park. All machinery will be inspected by NPWS or PV prior to unloading to ensure that it is clean and suitable for use within the sites. All personnel must complete a project induction prior to commencing work on site, which will include the weed and pathogen hygiene protocol.	1	2	Negligible
730	Site monitoring	Conduct flora and fauna survey	Potential impact from increased vehicle traffic	✓	✓	✓		2	2	Low	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. As natural surface tracks established during the treatment phase will be closed immediately after treatment is completed, access for monitoring will occur by foot from existing site access roads. Monitoring will occur under a NSW scientific licence and NSW animal care and ethics licence. A research permit from DEPI will be obtained prior to commencement of scientific monitoring activities on public land in Victoria. If the species is identified, the threatened species contingency protocol will be followed, including notifying the Project Manager. The Project Manager will consult with a suitably qualified ecologist to determine an appropriate action. Injury or death of all native fauna species are to be reported to be immediately reported to the Project Manager. The Project Manager will maintain a record of each occurrence of the listed species within plots, as well as the action taken. Vehicles will be limited to existing park access roads. A 50 km/h speed limit will apply. All personnel must complete a project induction prior to commencing work on site, which will include information on EPBC Act listed flora and fauna.	2	2	Low
731	Site monitoring	Conduct flora and fauna survey	Potential impact from increased fire frequency associated with additional ignition sources, such as vehicles and equipment	✓	✓	✓		2	3	Medium	Site selection avoided known occurrences of listed species. Further, if listed species were identified in a plot, it was assigned as a control plot, it was assigned as a control plot. Surveys of flora and fauna in treatment and control plots will be conducted by a suitably qualified ecologist. Machinery that may be a source of ignition will not be used during periods of extreme fire danger or days of Total Fire Ban. Fire extinguishers (water only) will be readily available in periods of high fire danger. Chainsaws and machinery will be fitted with functioning spark arresters. Fire extinguishers will be located within machinery in order to combat fuel fires. A Fire Emergency and Evacuation Plan will be prepared for each site and implemented. This will provide detail of the nearest evacuation point and all relevant emergency services contacts. No fires will be lit on the site and littering of cigarette butts will not be permitted. All personnel must complete a project induction prior to commencing work on site, which will include details of fire management requirements.	1	3	Low

Appendix 8 – Details of existing surface water and groundwater monitoring conducted in Barmah–Millewa

Monitoring in response to flooding events

Blackwater is a naturally occurring function where a high concentration of dissolved organic carbon is present in the water column (Watkins *et al.* 2010). Levels of blackwater concentrations are dependent on the regularity, extent and duration of flooding events, water temperature, and the volume of organic matter and leaf litter accumulation during dry periods. While this process plays an important role in contributing organic carbon and nutrients to river systems from their floodplains, high concentrations of blackwater can lead to hypoxia (extremely low levels of dissolved oxygen) which is highly likely to have major consequences for floodplain, wetland and river ecosystems (e.g. fish kills) (Howitt *et al.* 2007; King *et al.* 2010).

Surface water quality monitoring is undertaken in response to flooding events to monitor blackwater events within the Barmah-Millewa Forest by NPWS and GBCMA. This information is provided to the MDBA River Murray Operations Groups during weekly telephone conferences so that mitigation measures (e.g. dilution flows) for hypoxic blackwater can be planned and implemented (Childs *et al.* 2012).

Water quality monitoring is undertaken using a 'Hydrolab Quanta' water quality meter. These units provide spot measurements for temperature, dissolved oxygen, conductivity, pH, ORP (Redox), depth and turbidity. The location of monitoring sites vary occurring to the extent of the flooding event, the location of potential effluent sites (where flows from the forests return to the river system) and at locations which allow the assessment of cumulative changes in water quality (Childs *et al.* 2012).

Groundwater

Within the context of the Murray-Darling Basin, groundwater plays a key role in the transport and accumulation of salts in floodplain soils and wetlands, which can compromise ecosystem health. In addition, the displacement of saline groundwater during flood cycles can lead to significant increases in the discharge of salts from floodplains to the main river channels (Jolly *et al.* 1994).

The Murray River and floodplain between Tocumwal and the Goulburn River junction loses water to the groundwater aquifer and has a low risk of discharge of saline groundwater to the ecosystem (CSIRO 2008). Groundwater monitoring occurs across the Barmah forest from a network of 98 bores. Principally, monitoring of groundwater includes the measurement of groundwater level and salinity. A recent review of the data from bores located in Barmah between 1995 and 2004 indicated that groundwater levels had declined due to dry climatic conditions. The review also found that the current threat of saline groundwater on Barmah forest was low. This review also assessed the frequency of monitoring as adequate (SKM 2005).

The relationships between River Red Gum Site Quality (stand height), forest topography, flood frequency and watertable depth is detailed in the Murray Management Area Plan (FCNSW 1985).

Annual water quality monitoring

Additional to the monitoring undertaken during flooding events, water quality monitoring is undertaken at five wetland sites in Millewa and six wetland sites in association with understorey condition monitoring in Barmah under The Living Murray program under contract through the Goulburn-Broken CMA.

Conclusions

At a flow metering workshop held in Deniliquin, NSW on 29-30 August 2012 the CSIRO advised that the Barmah-Millewa Forest groundwater aquifers vary significantly in their depth and extent (M. Colloff pers. comm. 2012). Further considering this, it is likely that any information derived from the monitoring of surface flows and groundwater infiltration at thinning sites was likely to provide no meaningful data.

The current level of monitoring both for surface water (using the staff gauges and HDM, and targeted at potential blackwater events) and groundwater is considered adequate. NPWS, PV and DEPI are committed to maintaining this current level of monitoring. As a result, no additional monitoring will be implemented as part of this proposed activity

The *National Water Quality Management Strategy (NWQMS)* strategy provides a joint national approach to improving water quality in Australian and New Zealand waterways. Water quality monitoring is undertaken when

flows in the Murray River result in the flooding of the forest. Results of this monitoring are provided to the MDBAs River Murray Operations Group.

The current level of monitoring undertaken within the Barmah-Millewa forests is considered to be adequate and complies with NWQMS.

Appendix 9 – Report on outcomes of the Process Model Consultative Group Workshop

Expert judgment of the ecological response of Barmah-Millewa communities to manipulation of stand structure and surface water

Report on outcomes of a workshop held 18 – 19 August 2011 at Moama

Terry Walshe[1], Libby Rumpff[1] and Emma Gorrod[2]

[1] School of Botany, University of Melbourne.
[2] New South Wales Office of Environment and Heritage

INTRODUCTION

Perceived threats to natural values of Barmah-Millewa include stand thickening in River Red Gum (RRG) forests and woodlands, and encroachment of River Red Gums in wetlands and grasslands. The NSW and Victorian State Governments are adopting an Adaptive Management (AM) framework to learn about the most appropriate management actions to address these threats. The first phase of the AM framework aims to address stand thickening of RRG forests through an ecological thinning trial in Barmah-Millewa National Park. A workshop was held 18 - 19 August 2011 to initiate development of a process model for RRG ecosystems. In the context of the ecological thinning trial, a process model is sought to better predict likely responses of RRG ecological communities to thinning. The intention is that the process model will represent current understanding of the mechanisms by which driving processes act to alter on-ground features of relevance to managers (i.e. to represent models of cause-and-effect). Secondarily, a process model is sought to inform the broader AM framework, which may include additional alternative management actions in non-forest RRG ecological communities. Outcomes will inform ongoing development of a quantitative model.

The core theme of the workshop was elicitation of plausible models of ecological cause-and-effect under alternative management scenarios from the participants listed at Appendix 1. Two management options relevant to thickening and encroachment of RRGs explored in this workshop were: removal of stems and surface water management.

Background to elicitation of expert judgement

Models are a critical component of adaptive management as they help represent our beliefs about ecosystem properties and dynamics, and project the consequences of how the system responds to management. People differ in perceptions of the merit of alternative management actions because they have:

- different understandings of cause-and-effect,
- different objectives or ecological priorities, and
- different attitudes to risk (Howard 2007).

Independently derived models of cause-and effect may illuminate controversy among scientists about how to best describe biophysical (or other) systems. This is especially true in risk management and adaptive management, where the behaviour of a system under extreme conditions or novel management is of interest (Burgman 2005). Scientists refer to difficulties in model specification as model uncertainty. This uncertainty matters when it impacts on our ability to choose between management options. Adaptive management seeks to resolve this kind of model uncertainty over time through iterative updating of the plausibility of competing models.

A coarse distillation of behavioural and cognitive psychological research on expert opinion is that 'experts know a lot but predict poorly' (Camerer and Johnson 1991). Expert judgment can be compromised by overconfidence, motivational bias and a raft of psychological frailties associated with probabilistic reasoning (Armstrong 2001, Yaniv 2004, Kahneman and Tversky 1984). Knowledge may involve configural rules and cues, of which a substantial proportion may be inaccurate. For example, fire experts have comprehensive knowledge of the physical determinants of fire behaviour, but predict the spread of fire poorly when variables such as wind direction and slope are in opposition (Lewandowsky and Kirsner 2000).

Whilst numerous approaches to expert elicitation have been developed for individual events or distributions, there are few formal methods for elicitation or representation of models of cause and effect (Hodgkinson et al. 2004). Any approach involves trade-offs among elicitation burden, inferential clarity and susceptibility to overconfidence.

ELICITATION APPROACH USED IN WORKSHOP

The approach we used to elicit cause-and-effect narratives was based on a procedure developed by Nadkarni and Shenoy (2004) for deriving conceptual models. This approach used a combination of unstructured interviews to elicit a narrative of knowledge, and systematic content analysis to convert this knowledge to a conceptual model. Language based ambiguities were addressed during the process, but trade-offs involving broader social objectives and risk attitude were not directly addressed. The approach provided substantial inferential clarity while buffering against the psychological frailties of expert judgment through structured development of causal judgments. The red gum workshop was constrained in the time it had available to elicit expert judgments.

We used a state and transition modelling approach, which is useful for quantitatively describing dynamics in ecological communities (Rumpff et al. 2011). State-and-transition models represent different states of vegetation condition that exist in the landscape, and the transitions that may occur between states. The approach requires identification of alternative states defined by specified state variables; probabilistic estimation of the chance of transitioning from one state to another under alternative management actions; and process variables that condition the chance of transition. We elicited these elements using the format shown in Figure 1.

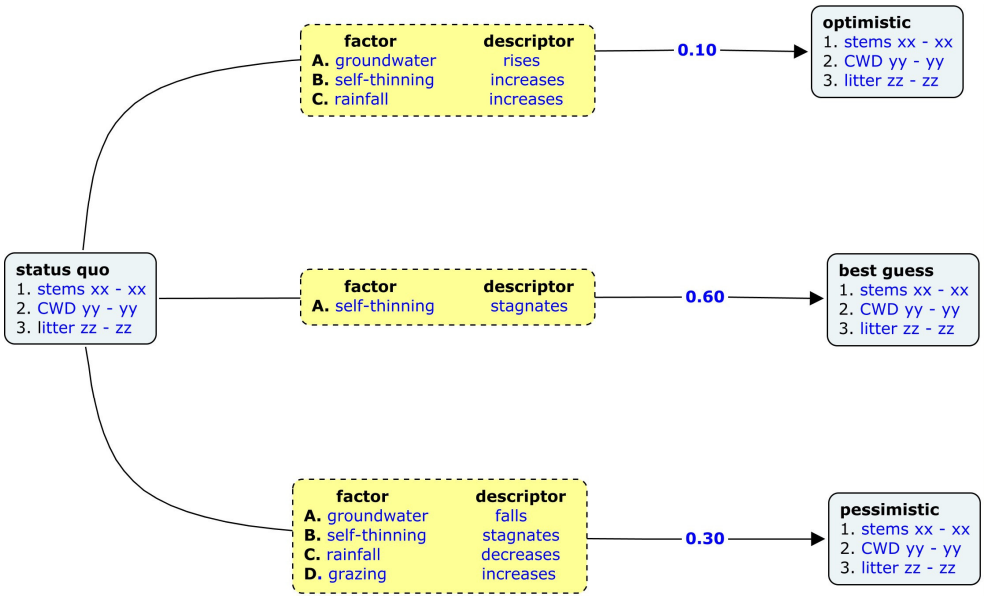


Figure 1. Example of judgments elicited from participants. The probability of transitioning from an initial (status quo) state to three plausible future states in 60 years time was elicited for each community and each management scenario. Yellow boxes contain process variables that summarise the key factors that influence outcomes.

Participants were first asked to discuss the various vegetation types, or states, that existed within the Barmah-Millewah National Park. Three terrestrial ecological communities were defined by group consensus: wetland/grassland; red gum forest; and woodland. These communities were considered to be broadly representative of the vegetation that occurs along a moisture gradient from permanent or semi-permanent inundation (wetland/grassland), through flood dependent (forest) to intermittently flooded (woodlands). Participants were then asked to generate a list of state variables that describe the structural, compositional and functional elements of the three vegetation communities (Table 1). For the remainder of the elicitation process, participants worked in community-specific small groups according to their particular interests and expertise. The community-specific groups were asked to select a subset (up to five) of the candidate variables shown in Table 1 that best described the response of the vegetation community to alternative tree removal and surface water treatments.

Table 1. Candidate state variables elicited for each of the vegetation communities.

FORESTS		
Large red gums	Seed production	Weeds
Diversity of stand structure (incl recruitment)	Standing dead trees	Pests
Canopy health (leaf area index)	Terrestrial macro-invertebrates	Terrestrial native fauna species
Diversity of mid- and under-storey native plant species	Spatial and temporal variability in water	Tree hollows
(Diversity of) coarse woody debris	Ground and tree dwelling fauna (appropriate levels, excl overabundant natives	Water birds

Water presence		
WOODLANDS (same as forests, except)		
Minus water presence	Plus appropriate level of understorey species	Plus woodland birds
Plus rainfed water important		
WETLANDS/GRASSLANDS		
Low tree density	Water (standing) – spatial and temporal variability	Woody debris
Diversity and abundance of aquatic flora	Structural complexity of aquatic vegetation	Diversity and abundance of vertebrates
Fish/amphibians	Colonising wetland birds (breeding)	Connectivity of water
Aquatic invertebrates	Weeds	Soil structure
Exotic fish pests	Algal blooms	Water quality

For each of the three communities we focussed on transition from a starting point representing the current state of each ecosystem (i.e. the 'status quo', Figure 1) to plausible states that may be observed after 60 years of management (blue boxes on the right hand side of Figure 1). The community-specific small groups were asked to describe the starting state for the state variables they had selected (Table 2). When defining the values of state variables, we encouraged consideration of plausible bounds around best estimates to guard against overconfidence. We required participants to develop models independently in small groups to insulate against groupthink, and to then cross-examine perspectives and review judgments in the light of fresh insights. We avoided uninformative complexity in causal narratives by constraining the number of variables that participants could include in their models (Özesmi and Özesmi 2004).

Table 2. Characterisation of the typical extant condition of the three ecological communities using selected state variables.

Forest	
total eucalypt stem density	300-500 stems/ha
large (>100cm dbh) stem density	<2/ha
coarse woody debris	<10 tonne/ha
plant richness	<15 species/ha
soil biological activity	low

Grassland	
total eucalypt stem density	10-50 stems/ha
Moira grass cover	0-50 %
frog richness	5 species
inundation	<0.5m, 1 in 2 years

Woodland	
small (<80cm dbh) stem density	100 stems/ha
large (≥80cm dbh) stem density	1 – 2 stems/ha
coarse woody debris	15-20 tonne/ha
understorey species richness	2-10 species

bird species richness	5-10 species/20 min
crown extent	70 %

Participants were asked to provide their best estimate, optimistic and pessimistic judgments about how each of the state variables would change for four management scenarios. Participants were also asked to identify the processes driving those changes (Figure 1, factor), and the direction in which those processes were changing (Figure 1, descriptor).

The four management scenarios were as follows:

1. Do nothing – no active tree removal or change in surface water management
2. Tree removal
3. Surface water management
4. Tree removal *and* surface water management

The 'tree removal' scenario involved operations at a landscape scale:

- Forests – medium intensity thinning; retention of 'habitat' (i.e. hollow bearing) trees
- Woodlands – medium intensity thinning; retention of 'habitat' (i.e. hollow bearing) trees
- Grassland/wetlands – remove all trees

The current surface water regime for each of the three communities is described in Table 2a. Participants assumed this regime operated over the last 5 – 10 years and used it as a basis for its consideration of the 'do nothing' scenario. Table 2b describes a notional regime under the 'surface water management' scenario.

All management alternatives assumed a modest maintenance budget for follow-up tree removal, pest and weed control, and prescribed burning.

Table 2. Current (a) and notional future (b) surface water regimes of Barmah-Millewa communities.

(a) Current

Community	**Depth**	**Duration**	**Frequency**
Forest	> 0	2-3 months	5 out of 10 years
Woodland	> 0	2 weeks	1-3 out of 10 years
Grassland	0.5 m	2-3 months	4 in 10 years

(b) Notional future

Community	**Depth**	**Duration**	**Frequency**
Forest	> 0	3-5 months	5-7 out of 10 years
Woodland	> 0	1 month	3-5 out of 10 years
Grassland	0.5 -1m	6 months	

OUTCOMES

Outcomes of the workshop are shown at Appendix 2. For woodlands and grasslands, participants identified a consensus model. For forests, two competing models were developed.

Results will be further developed to formalise the state and transition model as a Bayesian Belief Network, as in Rumpff et al (2011). Bayesian Networks are favoured as they allow prior beliefs about system response to be updated as new data arises, they have the ability to deal with a mix of data sources, they can be built with stakeholders, and they are presented graphically, thus facilitating communication.

References

Armstrong, J.S. (2001). Combining forecasts. In J.S. Armstrong (Ed.), *Principles of forecasting: A handbook for researchers and practitioners* (pp. 417-439). Norwell, MA: Kluwer.

Burgman, M.A. (2005). *Risks and decisions for conservation and environmental management.* Cambridge University Press, Cambridge.

Camerer, C.F. and Johnson, E.J. (1991). The process – performance paradox in expert judgment. How can experts know so much and predict so badly? In: K.A. Ericsson and J. Smith. *Toward a general theory of expertise*. *Prospects and limits.* Cambridge University Press, Cambridge. pp. 195-217.

Hodgkinson GP, Maule AJ, Brown, NJ. (2004). Causal cognitive mapping in the organizational strategy field: A comparison of alternative elicitation procedures. *Organizational Research Methods,* 7: 3-26.

Howard, R. A. (2007). The foundations of decision analysis revisited. In: W. Edwards, R.F. Miles Jr. and D. von Winterfeldt (eds). Advances in decision analysis. From foundations to applications. Cambridge University Press, Cambridge. pp. 32 – 53.

Kahneman, D. and Tversky, A. (1984). Choices, values, and frames. *American Psychologist.* 39: 342-347.

Lewandowsky, S. & Kirsner, K. (2000). Knowledge partitioning: context-dependent use of expertise. *Memory and Cognition*, 28: 295-305.

Nadkarni, S. & Shenoy, P.P. (2004). A causal mapping approach to constructing Bayesian networks. *Decision Support Systems*, 38: 259-281.

Özesmi, U. and Özesmi, S.L. (2004). Ecological models based on people's knowledge: a multi-step fuzzy cognitive mapping approach. *Ecological Modelling*, 176: 43-64.

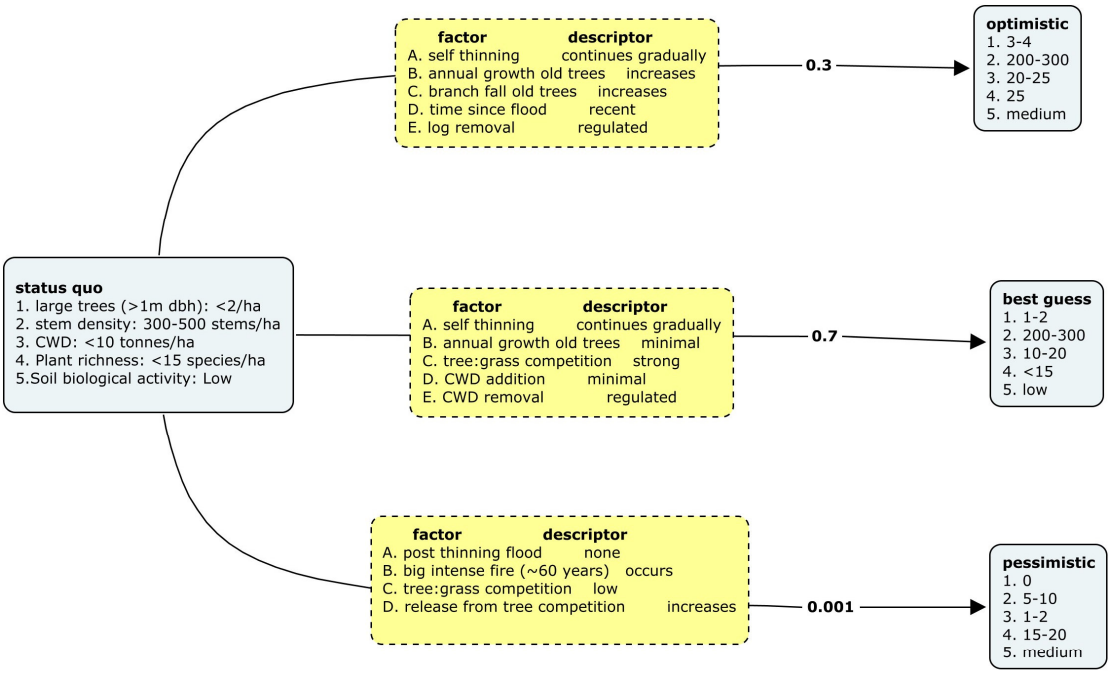
Rumpff, L., Duncan, D.H., Vesk, P.A., Keith, D.A. and Wintle, B.A. (2011). State-and-transition modeling for Adaptive Management of native woodlands. *Biological Conservation*, 144:1224 -1236.

Yaniv, I. (2004). The benefit of additional opinions. *Current Directions in Psychological Science,* 13: 76-79.

Appendix 1 List of participants

Terry Walshe (facilitator)	University of Melbourne
Libby Rumpff (facilitator)	SAC, University of Melbourne
Emma Gorrod (facilitator)	NSW Office of Environment & Heritage
Andrew Hayward	Vic Department of Sustainability and Environment
Barbara Downes	University of Melbourne
Ben Tate	Water Technology
David Keith	NSW Office of Environment & Heritage
Ian Lunt	SAC, Charles Sturt University
Keith Ward	Goulburn Broken CMA
Leon Bren	SAC, University of Melbourne
Michael Pennay	NSW Office of Environment & Heritage
Patrick Pigott	Parks Victoria
Phil Peglar	Parks Victoria
Richard Kingsford	SAC, University of NSW
Rick Webster	NSW Office of Environment & Heritage
Sharon Bowen	NSW Office of Environment & Heritage
Shaun Cunningham	Monash University
Skye Wassens	SAC, Charles Sturt University
Steve Hamilton	Water Technology
Tuesday Phelan	Vic Department of Sustainability and Environment

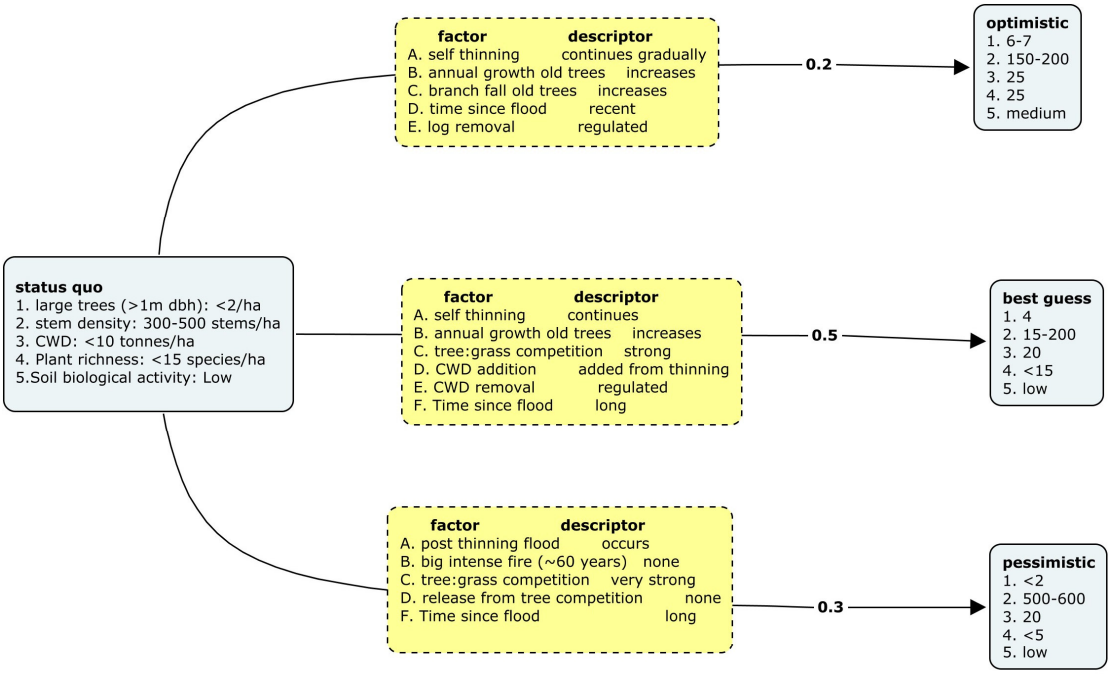
Appendix 2 - Expert judgments
Forests (Group 1)



Group: Forest1

Community: Forest

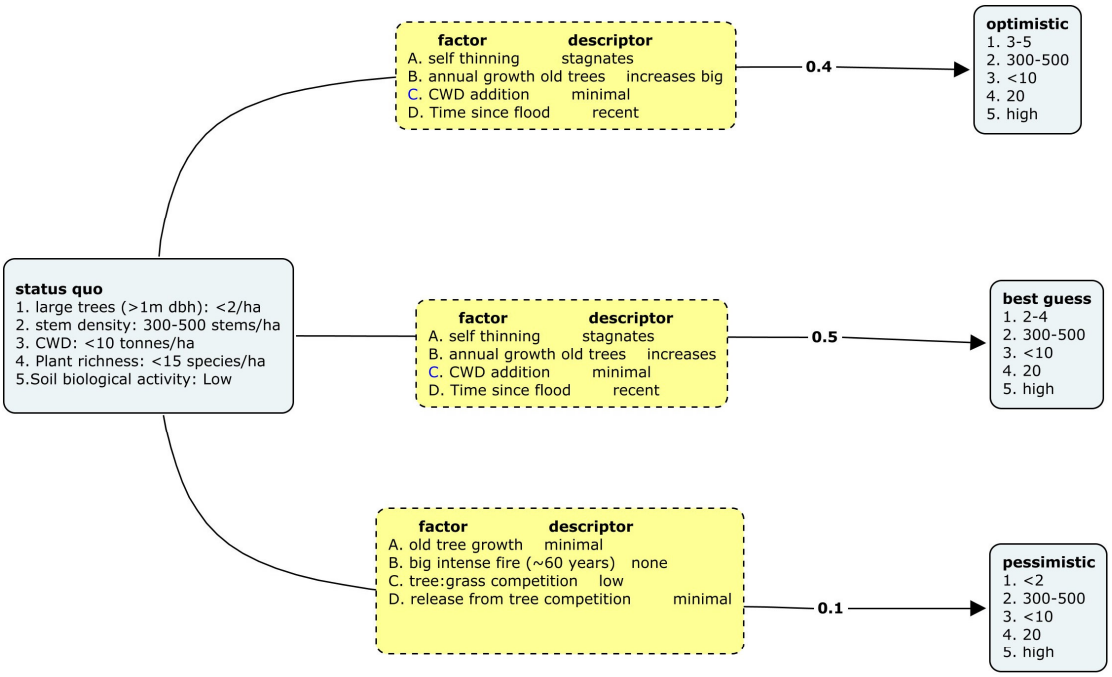
Alternative: do nothing



Group: Forest1

Community: Forest

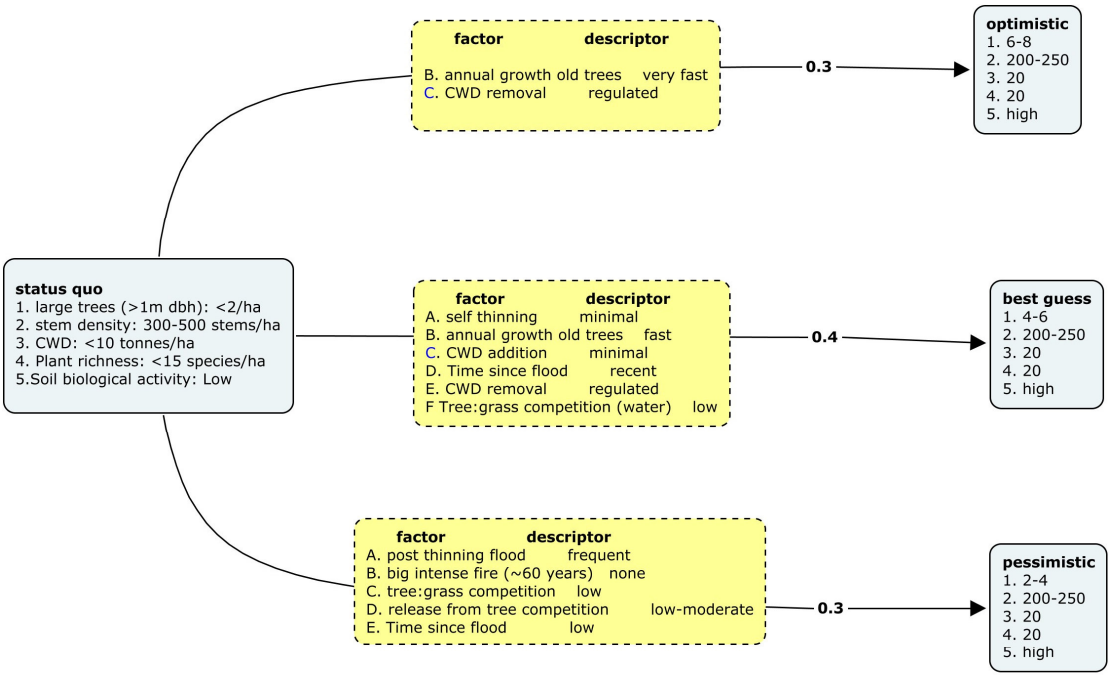
Alternative: tree removal



Group: Forest1

Community: Forest

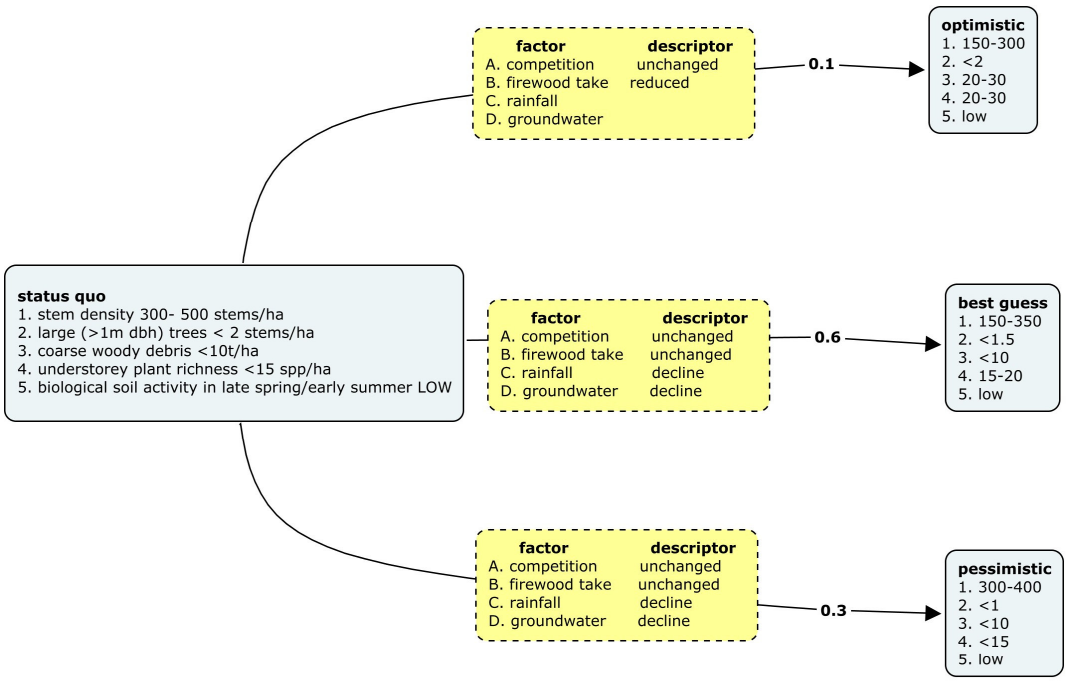
Alternative: water



Group: Forest1

Community: Forest

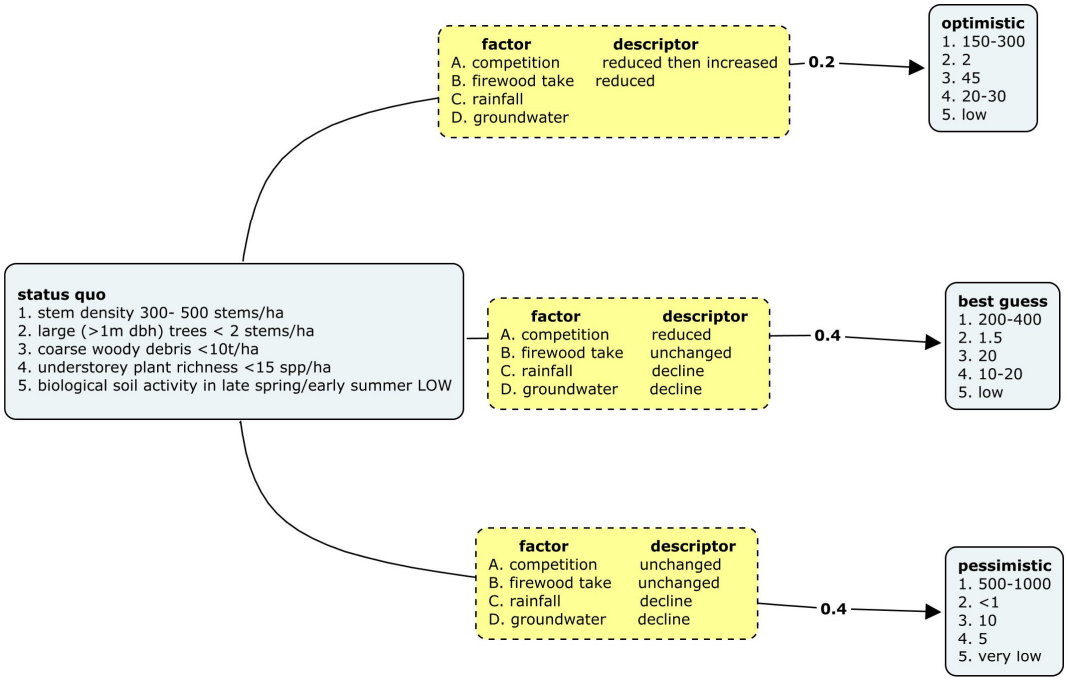
Alternative: water and tree removal



Group: Forest2

Community: Forest

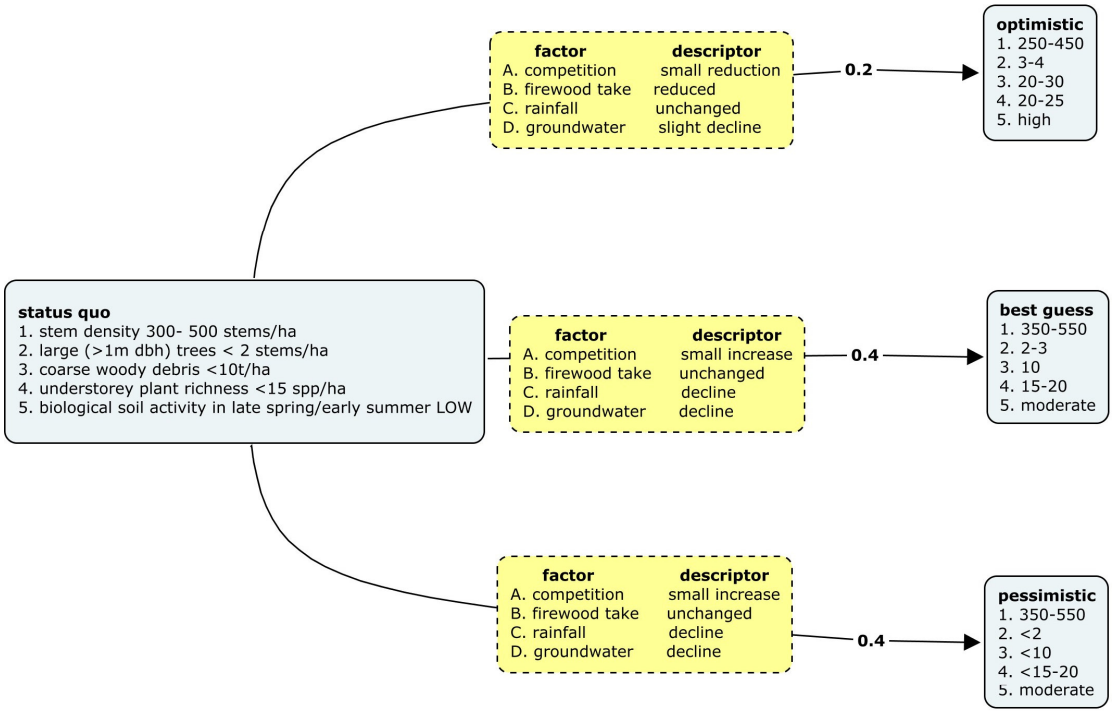
Alternative: do nothing



Group: Forest2

Community: Forest

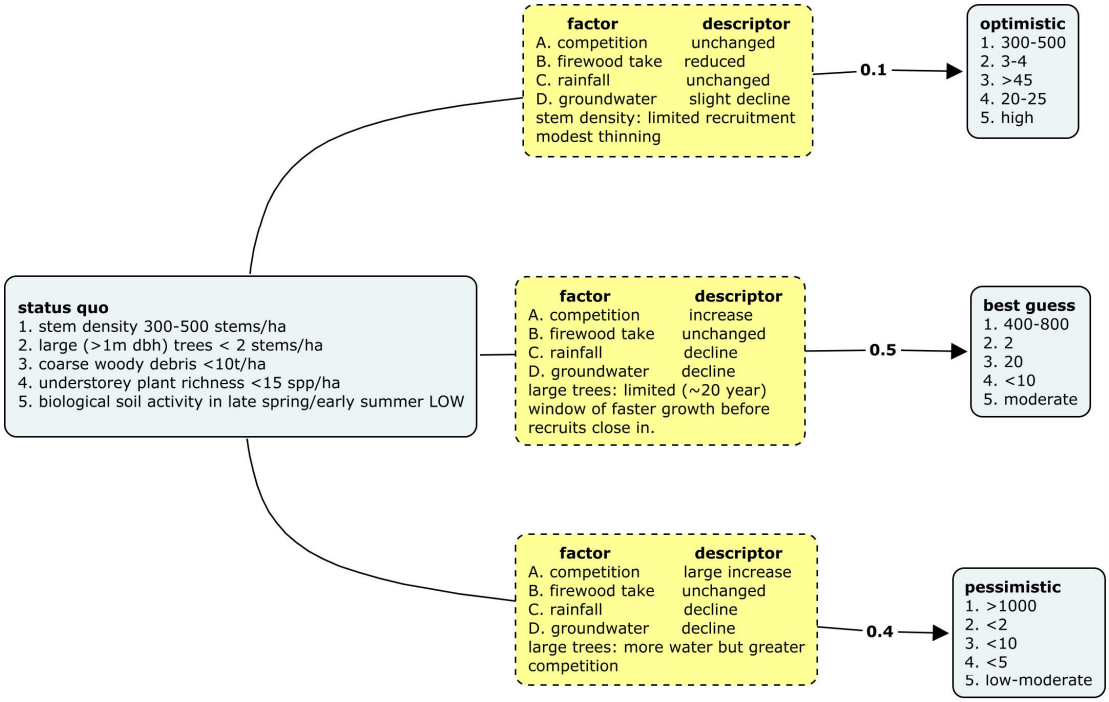
Alternative: tree removal



Group: Forest2

Community: Forest

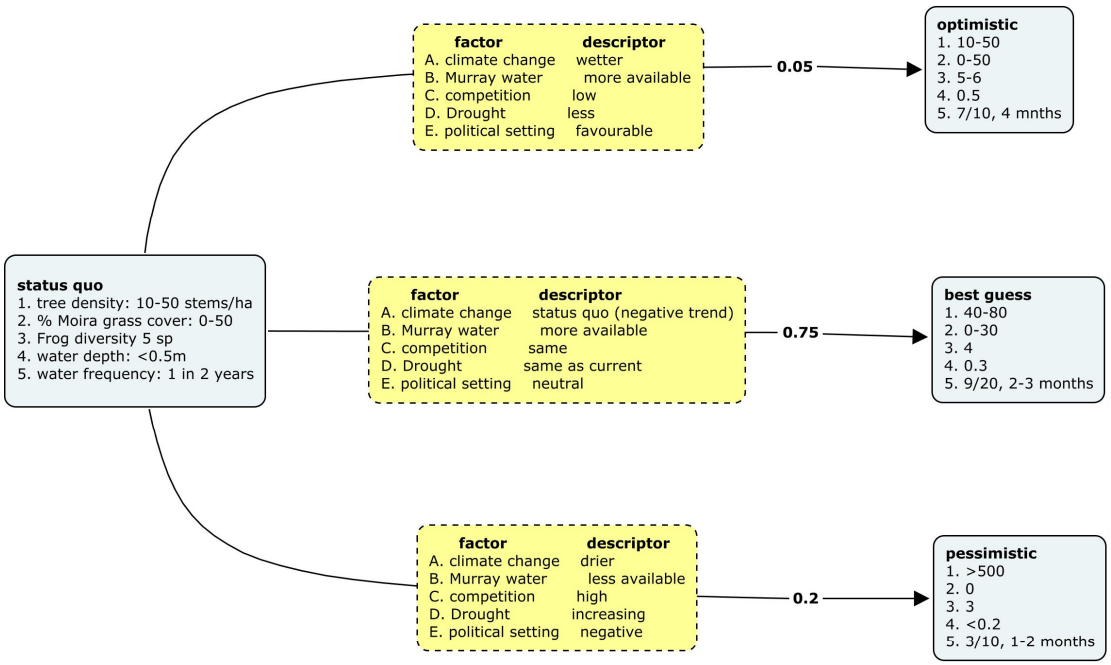
Alternative: water



Group: Forest2

Community: Forest

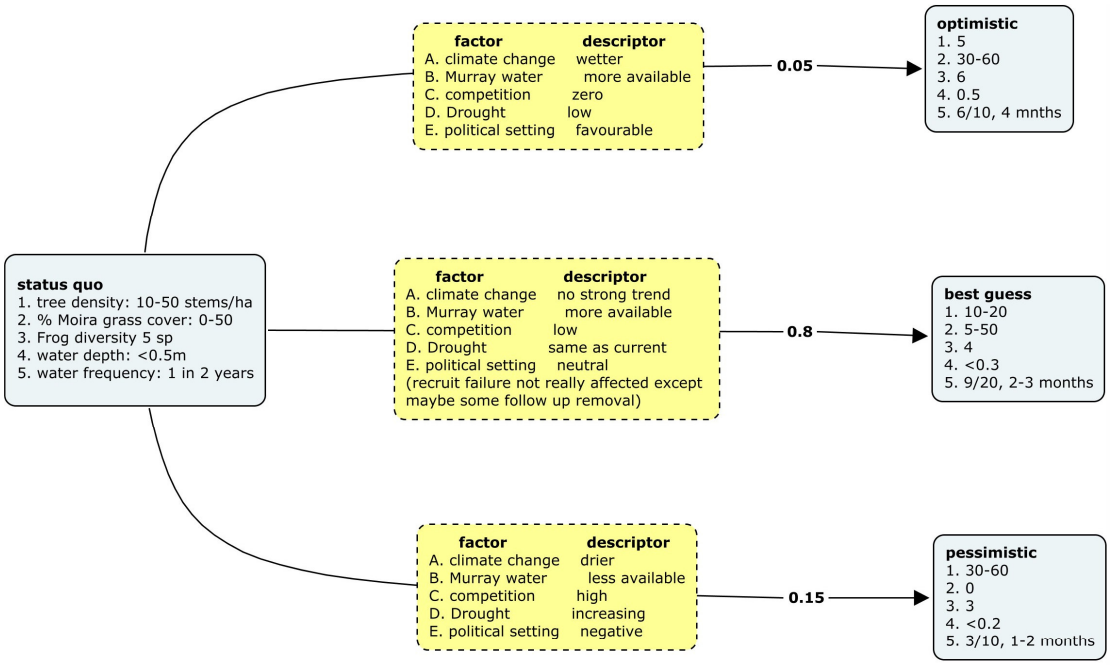
Alternative: water and tree removal



Group: grassland

Community: grassland

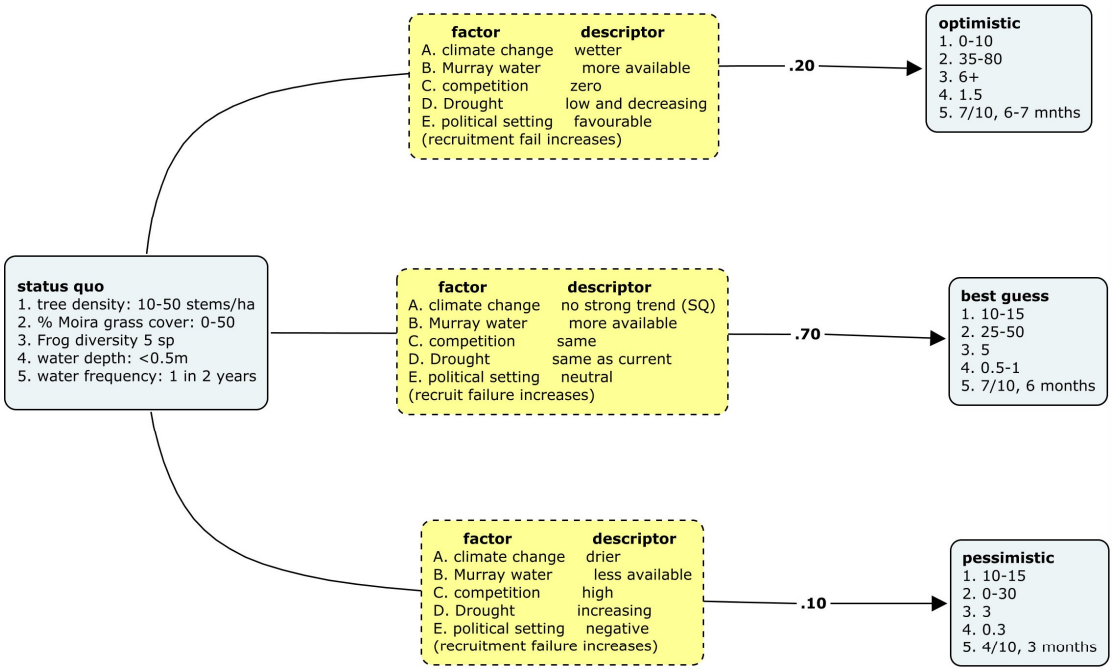
Alternative: do nothing



Group: grassland

Community: grassland

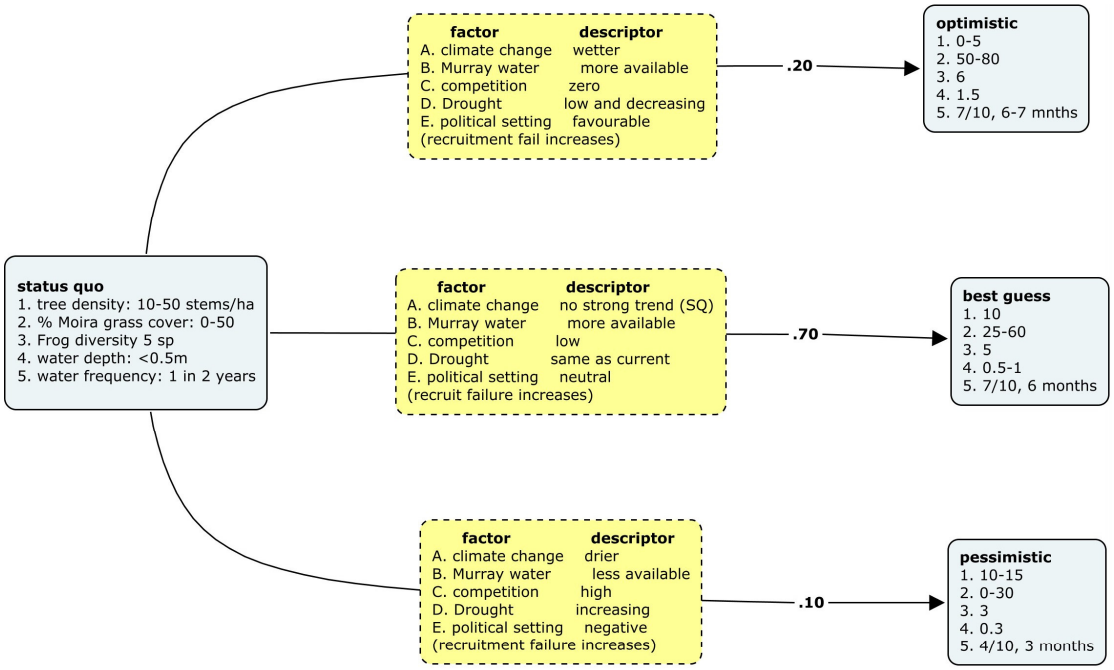
Alternative: tree removal



Group: grassland

Community: grassland

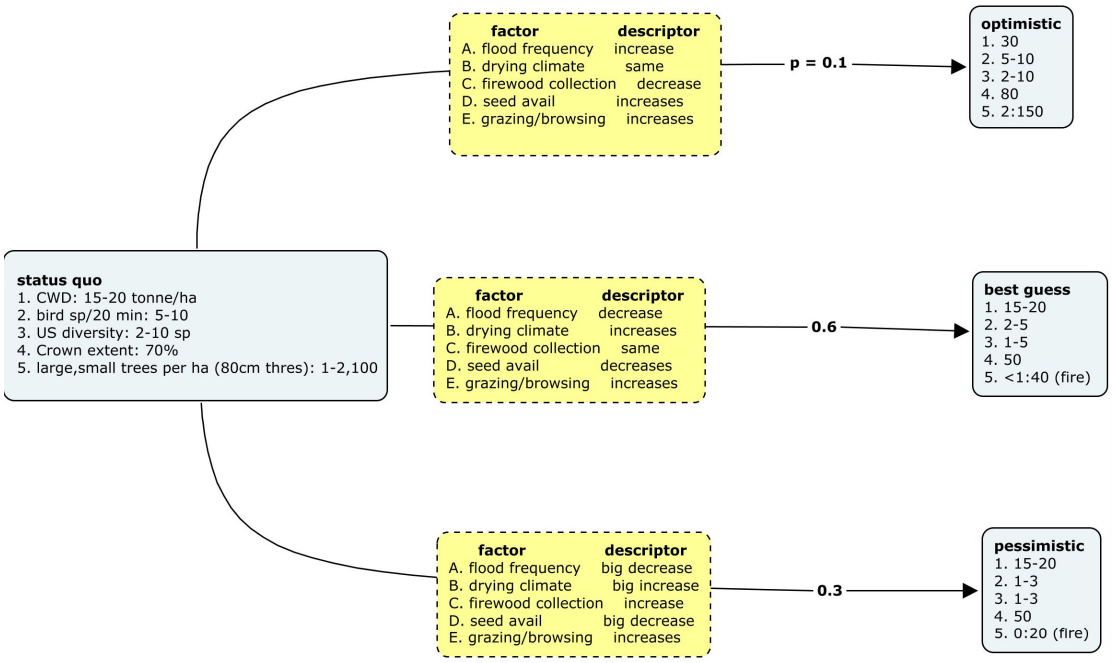
Alternative: water



Group: grassland

Community: grassland

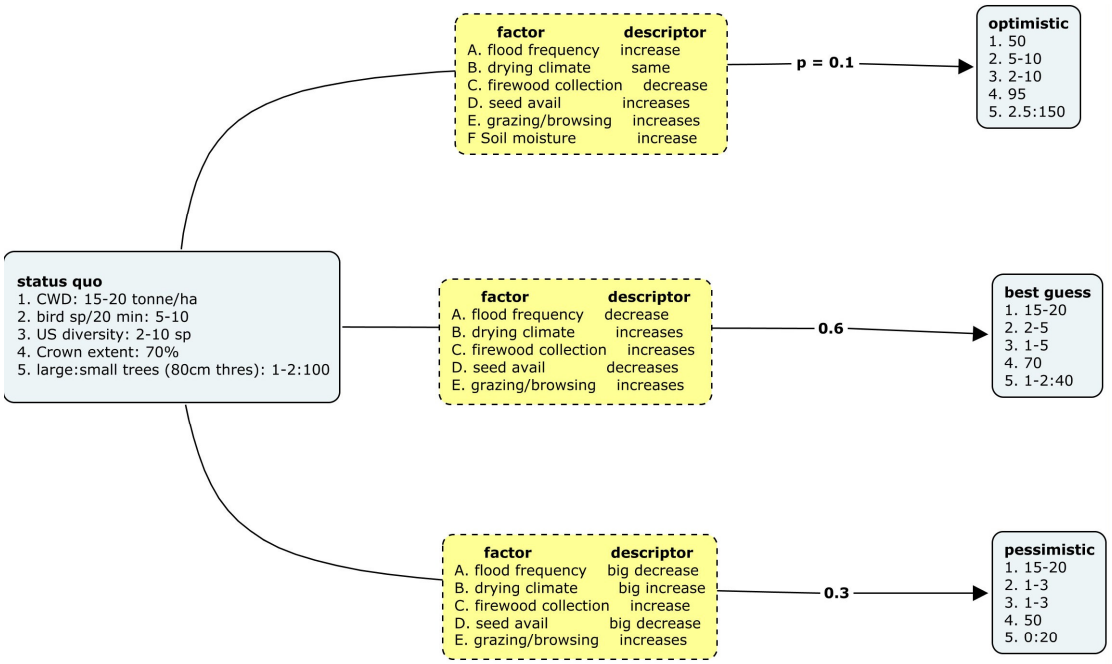
Alternative: water and tree removal



Group: woodland

Community: woodland

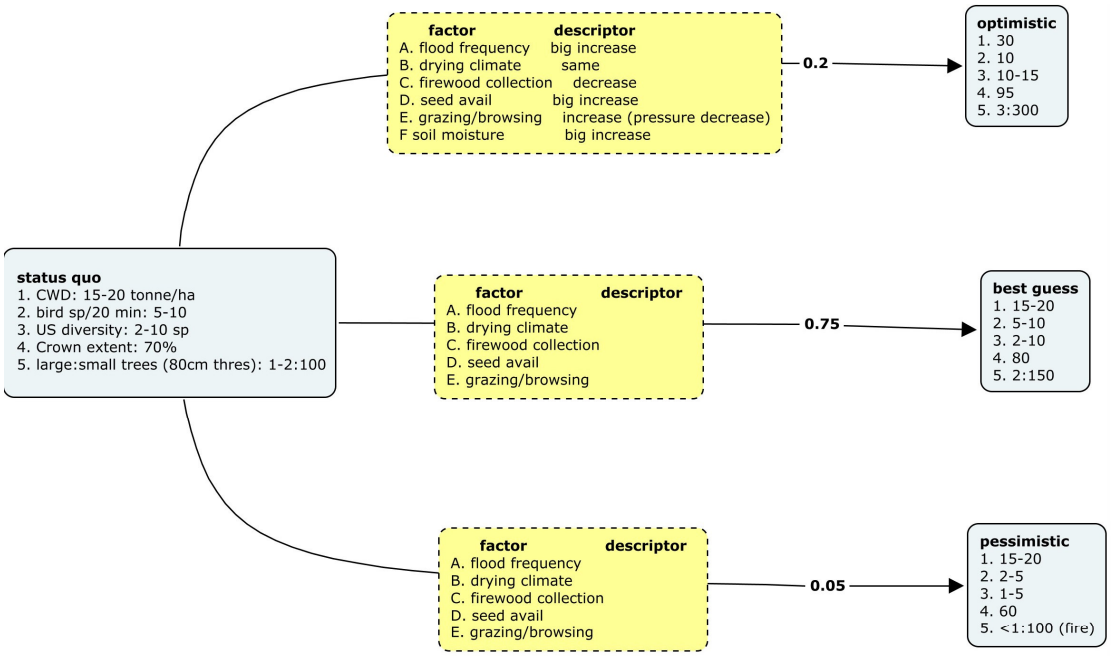
Alternative: do nothing



Group: woodland

Community: woodland

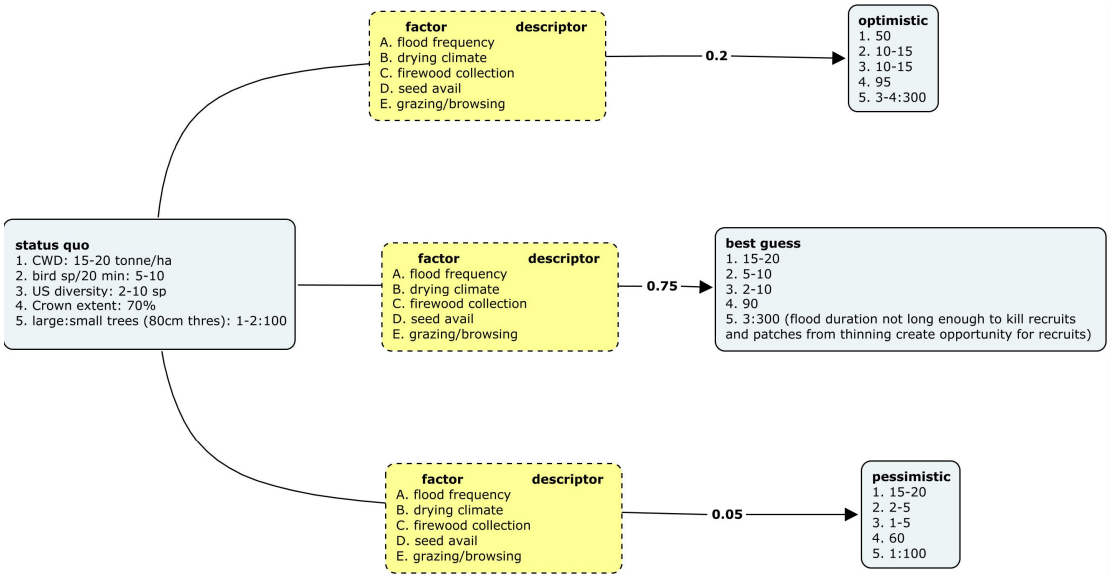
Alternative: tree removal



Group: woodland

Community: woodland

Alternative: Water



Group: woodland

Community: woodland

Alternative: water and tree removal

Appendix 10 – Letter from SEWPaC to OEH and DEPI re: independent scientific peer review of the proposed ecological thinning trial

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

EPBC Ref: 2013/6713

Mr Mark Peacock
Director Western
NSW Office of Environment and Heritage
National Parks and Wildlife Service
PO Box 1020
DUBBO NSW 2380

Dear Mr Peacock

Public Environment Report – independent scientific peer review
Ecological Thinning Trial in NSW and Victoria River Red Gum Parks
(EPBC 2013/6713)

Thank you for your letter of 13 August 2013 to Ms Tessa Bird, the former Director, Victoria Section, concerning the requirement for a scientific review of the ecological thinning trial, in particular concerning the use of the previously established River Red Gum Adaptive Management Scientific Advisory Committee (SAC) to address Part 9 of the Public Environment Report.

The department has considered the information provided in your letter, the terms of reference for the SAC and the scientific expertise of the members of the SAC. As required under Part 9 of the tailored guidelines for the content of a draft Public Environment Report, I agree that the SAC is an appropriate entity to conduct a peer review of the trial's objectives, experimental design, and methodology and to assess the expected robustness of results to achieve the stated objectives of the ecological thinning trial.

As described in the tailored guidelines for the content of a draft Public Environment Report, the NSW Office of Environment and Heritage and the Victorian Department of Environment and Primary Industries, as the proponents, will be required to provide a summary of the findings of the SAC's review, and include the complete review by the SAC as an attachment to the final Public Environment Report.

I look forward to the opportunity to review the draft Public Environment Report when it is available.

Yours sincerely

Charmayne Murray
Director
Victoria Section
11 September 2013

cc. Mr Duncan Pendrigh
Victorian Department of Environment and Primary Industries

Appendix 11 – Consideration of public submissions

NSW GOVERNMENT | Office of Environment & Heritage

Consideration of Public Submissions to the Ecological Thinning Trial in the New South Wales and Victorian River Red Gum Forests (EPBC 2013/6713)

Appendix 11 – Consideration of public submissions

Summary

- Fifty seven submissions were received.
- The submissions have been reviewed by the Office of Environment & Heritage.
- Thirty five issues of direct relevance to the Public Environment Report were found within the submissions (see below for List of Issues and recommended actions).

List of issues

No.	Issue
1	The trial should not occur within Barmah-Millewa as they are national parks, but on other tenure (i.e. State Forests)
2	Natural flooding regimes/environmental water are important and need to be returned
3	The trial impact on the ecological character of Ramsar wetlands
4	The trial impact on Threatened Species
5	The scale is too big and greater than the VEAC recommendation
6	The use of commercial machinery is inappropriate and will be damaging
7	Trial sets a precedent for forest thinning in all conservation reserves
8	The trial has no proven environmental benefits
9	The trial will increase the abundance of predators such as foxes
10	The trial will impact on fire risk
11	The trial will be a huge cost to taxpayers and could be better spent on other park management activities
12	Traditional Owner groups have not been consulted adequately and are not supportive of the trial
13	Parks Victoria have not been included appropriately, nor are supportive of the trial
14	The trial sounds like logging, using commercial forestry prescriptions
15	The residue will be sold on the commercial market
16	The Red Gum forests were never there as they are now
17	Return cattle to forest areas to clean up fire risk, including saplings
18	The trial will impact on visual aesthetics
19	The trial is an experiment, not a response to a conservation problem
20	The trial will result in increased sedimentation, turbidity, erosions, contamination, salination and soil compaction
21	There are other alternatives to consider (i.e. stem injection, fire etc)
22	Drought conditions no longer apply in these forests which is the driver of the trial
23	The trial should focus on River Red Gum encroachment on Moira Grass Plains

No.	Issue
24	The trial doesn't use a basal area approach
25	Mass regeneration of saplings will occur, and will require multiple passes to treat
26	Stags will be lost
27	The mapping is incorrect
28	The PER doesn't deal with State listed species
29	The trial needs to be supported by an adequate monitoring program
30	The trial will result in impacts from spray-drift from herbicides
31	Stakeholders weren't appropriately consulted
32	There is little attention given to weed control
33	The trial results in residue which will be used for firewood
34	The residue created could pose a risk to public safety
35	Forestry Corporation of NSW were not consulted adequately

ISSUE NO: 1

ISSUE: The trial should not occur within Barmah-Millewa as they are national parks. The trial should occur on other tenure (i.e. State Forest).

DISCUSSION

The Murray Valley National Park – Millewa Group has been selected for implementation of an ecological thinning trial because it contains sufficient stands of high stem density forest in which to adequately replicate thinning treatments. Forests with severe canopy dieback are excluded from the trial, as it is postulated that these forests are predominantly associated with discontinued artificial flooding via infrastructure, and therefore require consideration of alternative management actions within the adaptive management framework.

The trial is aimed at understanding the particular benefits of interventions in an area of high conservation value, and thus an area where effort is prioritised. The proponents have thoroughly considered risks associated with undertaking this activity within a national park. It is considered that the risks associated with the activity and the considered environmental safeguards and mitigation measures are adequate to protect the values of these areas.

RECOMMENDATIONS

- No action required

ISSUE NO: 2

ISSUE: Natural flooding regimes/environmental water are important and need to be returned

DISCUSSION

Stands of River Red Gum are intimately associated with the surface flooding regime of the watercourses and related groundwater flow. Water regime, including volume, seasonality and timing, is a major factor in maintaining forest health, ecological function and resilience. Considering ongoing river regulation and the likelihood of more frequent and intense droughts under climate change predictions, reducing tree density may be an effective management tool for improving the health of River Red Gum forests.

A range of interventions are occurring within Murray Valley National Park to manage its values. The use of environmental water is one such tool. Other programs include invasive animal and weed control and ecological burning. Processes and mechanisms are in place to deliver these programs. These activities are part of a comprehensive monitoring program. The outcomes of these programs work towards maintaining and improving ecosystem health.

With regard to flooding regimes, the trial design sets out sites which have been grouped according to their place on the floodplain in relation to likelihood and frequency of flooding.

RECOMMENDATIONS

- No action required

ISSUE NO: 3

ISSUE: The trial will impact on the ecological character of Ramsar wetlands.

DISCUSSION

While the trial may impact on the ecological character of a Ramsar wetland, it is not known whether this impact will, in the long-term, be a negative impact or a positive impact. For this reason a trial approach is proposed in order to investigate the usefulness of the thinning as a management tool.

While some short-term impacts may appear detrimental, the proponents believe that the environmental safeguards and mitigation measures outlined within the PER will minimise the risk of any long-term impacts on the ecological character of the Ramsar site such that they will not be negatively impacted upon by this activity.

The monitoring program and risk assessment has centred on ensuring that the values of this Ramsar site are maintained, and that any impacts are of a short-term duration.

It is recognised that the Millewa forest is listed as a Ramsar wetland. This area comprises a number of individual, but connected wetlands. It is these defined wetlands which will be buffered from the activity.

RECOMMENDATIONS

- Replace the term ‘wetland’ with ‘waterway’ according to the Australian Government’s and Murray Darling Basin Authorities RMW wetlands data.

ISSUE NO: 4

ISSUE: The trial will impact on Threatened Species

DISCUSSION

Desktop assessments along with field surveys have been undertaken targeting threatened species. Furthermore, all other species also encountered during pre-treatment surveys were also recorded.

Initial desktop assessments utilised wildlife (plant and animal) databases maintained by both NSW and Victorian environment departments. This review considered all known submitted records for EPBC-listed threatened species to these databases.

The proposed thinning trial sites were located (using ArcGIS) to avoid these known records. This provided the first level of consideration to minimise potential impact on EPBC-listed species.

Additional to this field-based targeted searches for threatened species have been undertaken. The information gathered during these searches further allowed for the on-ground consideration of site location. For example, where a significant record was obtained (i.e. Superb Parrot nest tree) the site was relocated or was identified for use as the control site. In doing this, impacts on EPBC-listed species were able to be further minimised.

All EPBC-species were considered as part of the above-mentioned processes. Importantly, all available data, including previous surveys undertaken by various departments and institutes were considered.

Further actions which will be implemented which aim to minimise the risk on EPBC-listed species include:

- Retaining all trees containing visible hollows
- Retaining all trees greater than 40 cm DBH
- Retaining all pre-existing coarse woody debris at each site
- Buffering around defined waterways
- Undertaking the activity outside of key breeding times of listed species

Further targeted survey will be undertaken for EPBC-listed species (as well as State-listed species) during the site mark-up phase of the activity. Environmental safeguards and mitigation measures are outlined in the PER should a species be recorded.

The PER is prepared under the *EPBC Act* and as such considers only those species or matters of national environment significance. Threatened species listed solely at a State level have been considered as part of State planning requirements for activities occurring on a national park.

RECOMMENDATIONS

- No action required

ISSUE NO: 5

ISSUE: The scale is too big and greater than the VEAC recommendation

DISCUSSION

The 9 ha plot size was chosen to ensure that thinning was applied at an appropriate spatial scale. This plot size also enables edge effects to be minimised. Smaller plot sizes increase risk of impacts of edge effects, and provide decreased opportunities for data collection.

The proposed ecological thinning trial has been developed by a team of expert scientists and ecological practitioners forming a clearly defined trial that is transparent in its aims and is underpinned by clear ecological objectives. An important part of the development of the methodology of the trial is that it be scientifically rigorous in nature. The proposed scale of the activity achieves this.

RECOMMENDATIONS

- No action required

ISSUE NO: 6

ISSUE: The use of machinery is inappropriate and will be damaging

DISCUSSION

A range of environmental standards, safeguards and mitigation measures have been developed to ensure that the potential impacts of machinery are kept to a minimum. The PER also outlines a range of operational guidelines for the use of machinery during the trial.

Mechanical thinning using aboricultural equipment is considered the safest method for the implementation of this trial.

Mechanical thinning allows the activity to be undertaken rapidly, reducing the duration of short-term impacts such as noise and dust.

A component of this trial is that all sites are treated within a short timeframe to ensure variables such as season, climate, flooding (if occurring) etc. is kept standard across all treatments.

RECOMMENDATIONS

- No action required

ISSUE NO: 7

ISSUE: Trial sets a precedent for forest thinning in all conservation reserves

DISCUSSION

This trial is only proposed within River Red Gum forests to investigate the potential use of ecological thinning in achieving conservation benefit. This trial is site-specific and hypothesis-specific.

RECOMMENDATIONS

- No action required

ISSUE NO: 8

ISSUE: The trial has no proven environmental benefits

DISCUSSION

It is recognised that this trial currently has no proven environmental benefits, and that those reported within the PER are assumed.

It is for this reason that the proposed ecological thinning in River Red Gum forests is being undertaken as a trial. Through undertaking a trial and implementing a rigorous monitoring program, the proponent will be able to investigate the potential benefits of such a program within River Red Gum forests.

In order to address key gaps in knowledge the trial has been developed by ecological experts, to investigate the use of ecological thinning as a tool for conservation management.

RECOMMENDATIONS

- No action required

ISSUE NO: 9

ISSUE: The trial will increase the abundance of predators, such as foxes

DISCUSSION

NSW National Parks and Wildlife Service (NPWS) conduct twice-yearly fox baiting throughout the Millewa Group of reserves at established permanent, numbered baiting stations. Bait stations are located along boundary and internal trails. Baits are laid, checked and replaced (if taken) and then collected according to standard methodology for fox baiting. Bait take is recorded and reviewed in comparison to average bait takes of previous baiting rounds and to determine activity change over time.

NPWS baiting programs have the ability to determine if fox activity is increasing (or decreasing). Regardless of the driver of an increase in activity, both programs have the ability to be increased in frequency in order to reduce fox numbers within the parks.

This is adaptive management in action.

RECOMMENDATIONS

- No action required

ISSUE NO: 10

ISSUE: The trial will impact on fire risk

DISCUSSION

A range of environmental standards, safeguards and mitigation measures have been developed to ensure that the potential impacts of machinery are kept to a minimum.

The amount of debris retained at each site has been modelled on the recognised benchmarks for River Red Gum forests. This is reflective of required standards for the retention of debris outlined in the Integrated Forestry Operations Approval for River Red Gum (IFOA).

NPWS undertake fire operational planning and conduct measures to minimise and mitigate wildfire risk.

RECOMMENDATIONS

- No action required

ISSUE NO: 11

ISSUE: The trial will be a huge cost to taxpayers and could be better spent on other park management activities

DISCUSSION

The NSW government views this activity as a priority investment in conservation and knowledge building.

RECOMMENDATIONS

- No action required

ISSUE NO: 12

ISSUE: Traditional Owner groups have not been consulted adequately and are not supportive of the trial.

DISCUSSION

All traditional owner groups have been and continue to be involved in the cultural values assessments for all sites where this activity is proposed. The requirements of the National Parks and Wildlife Act (NSW) have been satisfied.

RECOMMENDATIONS

- No action required

ISSUE NO: 13

ISSUE: Parks Victoria have not been included appropriately, nor are supportive of the trial.

DISCUSSION

The Victorian Department of Environment, Land, Water & Planning is no longer a joint proponent of this activity.

RECOMMENDATIONS

- No action required

ISSUE NO: 14

ISSUE: The trial sounds like logging, using commercial forestry prescriptions.

DISCUSSION

While the trial is based on, and involves the removal of trees, no trees removed during this trial will be used for commercial gain by enterprise.

The environmental safeguards and mitigation measures set out in the PER have been established in order to minimise the potential impact on existing conservation values while working to the scientific aims of the trial.

RECOMMENDATIONS

- No action required

ISSUE NO: 15

ISSUE: The residue will be sold on the commercial market.

DISCUSSION

All trees removed will either be retained in the landscape for biodiversity outcomes, or be used during the provision of the domestic firewood program run by the State government.

RECOMMENDATIONS

- No action required

ISSUE NO: 16

ISSUE: The Red Gum forests were never there as they are now.

DISCUSSION

Past land management practices have altered these River Red Gum forests in comparison to how they appeared when Europeans first arrived in the area.

The trial seeks to investigate the use of ecological thinning to improve existing forest health and ecosystem function.

RECOMMENDATIONS

- No action required

ISSUE NO: 17

ISSUE: Return cattle to forests area to clean up fire risk, including saplings.

DISCUSSION

This is not relevant to the scope of the proposed trial.

RECOMMENDATIONS

- No action required

ISSUE NO: 18

ISSUE: The trial will impact in visual aesthetics.

DISCUSSION

While the trial may impact on the visual aesthetics of the River Red Gum forests, the potential negative impacts of this disturbance are considered to be of a short-term duration.

The aesthetics of an open forest structure may be seen to be more pleasing to the beholder and consistent with historic forest structure.

The trial will use existing infrastructure, including roading. No new roads will be developed to undertake the activity, thus minimising aesthetic impacts.

RECOMMENDATIONS

- No action required

ISSUE NO: 19

ISSUE: The trial is an experiment, not a response to a conservation problem.

DISCUSSION

The trial is an experiment with the intent to investigate the use of ecological thinning to improve the conservation values of River Red Gum forests.

RECOMMENDATIONS

- No action required

ISSUE NO: 20

ISSUE: The trial will result in impacts of soil disturbance.

DISCUSSION

The proponents have thoroughly considered risks associated with undertaking this activity on soils. The management controls to mitigate the impact on soils are:

- Sites are located within close proximity to existing roads to minimise the need for the establishment of natural surface tracks
- Natural surface tracked will not be bladed off
- All plant and equipment will be maintained
- Controls in the event of spills
- A minimum 50 m buffer will be established around all defined waterways and 20 m around unmapped drainage lines
- Natural surface tracks will be closed off immediately after completion of the activity.

It is considered that the risks associated with the activity and the considered environmental safeguards and mitigation measures are adequate to protect the values of these areas.

RECOMMENDATIONS

- No action required

ISSUE NO: 21

ISSUE: There are other alternatives to consider thin trees (i.e. stem injection, fire etc)

DISCUSSION

A number of alternative options were considered in planning the trial. These are identified within section 3.2 of the PER.

RECOMMENDATIONS

- No action required

ISSUE NO: 22

ISSUE: Drought conditions no longer apply in these forests, which is a driver of the trial

DISCUSSION

Drought is not a principle consideration of this trial. Section 1.3 of the PER outlines the objectives of the activity which focus around forest health.

RECOMMENDATIONS

- No action required

ISSUE NO: 23

ISSUE: The trial should focus on River Red Gum encroachment on Moira Grass Plains

DISCUSSION

It is well understood that there is encroachment of River Red Gum across Moira Grass Plains. This is a separate focus to what is proposed in the ecological thinning trial.

RECOMMENDATIONS

- No action required

ISSUE NO: 24

ISSUE: The trial doesn't use a basal area approach

DISCUSSION

The basal area approach is one way of measuring forest stands.

Stand structure can be measured using various approaches for which this trial has chosen stem density to measure stand structure. For further information regarding measuring stand structure refer to Section 2.1 of the PER.

RECOMMENDATIONS

- No action required

ISSUE NO: 25

ISSUE: Mass regeneration of saplings will occur, and will require multiple passes to treat

DISCUSSION

This is a component of the trial design and will be measured as part of the monitoring program.

RECOMMENDATIONS

- No action required

ISSUE NO: 26

ISSUE: Stags will be lost

DISCUSSION

The trial design protects habitat trees such as stags (refer to Table 6.4 of the PER). This includes all trees containing visible hollows. Additionally, all dead trees with a DBH of greater than 20cm will be retained.

RECOMMENDATIONS

- No action required

ISSUE NO: 27

ISSUE: The mapping is incorrect

DISCUSSION

The mapping produced for the planning of the ecological thinning trial reviewed all existing mapping products. These products were typically State focussed and no seamless, consistent mapping product existed for the trial area.

For the purposes of this trial, the first priority of mapping was the creation of a seamless map focussing on River Red Gum forest communities in which this trial would occur. Secondary to this was the mapping of other vegetation communities which may be passed through by vehicles used to implement the activity.

As part of the survey work undertaken to date as part of this activity, this mapping has been ground-truthed in regards to the potential for the activity to impact on all vegetation communities present within the parks. This ground-truthing found that the mapping is adequate to determine potential impacts of the activity on other communities.

Further ground-truthing of this mapping may be undertaken if this product is used in planning for other park management activities.

RECOMMENDATIONS

- No action required

ISSUE NO: 28

ISSUE: The PER doesn't deal with State-listed species

DISCUSSION

The PER has been developed under the requirements of the Commonwealth's EPBC Act. This requires consideration of all EPBC-listed species and Matters of NES, which may or may not include State-listed species.

Principle consideration of State-listed species is undertaken through State planning requirements, which have been undertaken for this activity.

RECOMMENDATIONS

- No action required

ISSUE NO: 29

ISSUE: The trial needs to be supported by an adequate monitoring program

DISCUSSION

A thorough, scientifically peer-reviewed monitoring program has been developed for this trial. This includes pre-thinning monitoring and comprehensive post-thinning monitoring programs. These are outlined in Appendix 1 of the PER.

RECOMMENDATIONS

- No action required

ISSUE NO: 30

ISSUE: The trial will result in impacts from spray-drift from herbicides

DISCUSSION

The use of herbicides will only be used for the treatment of cut stumps to minimise the risk of coppice regrowth. Machinery used to do this task emits a directed, single spray of herbicide to the target area.

The use of glyphosate at a 50:50 mix follows standards set by NSW Fisheries in the application of herbicides within floodplain areas.

Risks associated with the application of herbicide have been considered. The use of herbicides is outlined in both the PER and operational plans for each site. Environmental safeguards and mitigation measures are considered adequate to protect the values of these areas.

All staff and contractors using herbicides as part of the activity require appropriate chemical user approvals and/or licences.

RECOMMENDATIONS

- Update operation plans about handling and transport of herbicides.

ISSUE NO: 31

ISSUE: Stakeholders weren't appropriately consulted

DISCUSSION

The scope of communications with stakeholders is outline in Section 7 of the PER.

The public exhibition of the draft PER also plays a major role in the communication with stakeholders regarding this proposed activity.

RECOMMENDATIONS

- No action required

ISSUE NO: 32

ISSUE: There is little attention given to weed control

DISCUSSION

Weed control is a major park management activity.

The risks associated with the activity in causing an increase in weed populations has been considered and are outlined within the PER. The environmental safeguards and mitigation measures are considered adequate to protect the values of these areas and limit the spread of weeds as a result of this activity.

RECOMMENDATIONS

- No action required

ISSUE NO: 33

ISSUE: The trial results in residue which will be used for firewood

DISCUSSION

The trial requires the retention of woody debris to recognised benchmark levels. Above this, residue may be used for re-snagging or other biodiversity benefits or for domestic firewood programs. This is considered to be a positive outcome of the trial for local communities.

RECOMMENDATIONS

- No action required

ISSUE NO: 34

ISSUE: The residue created could pose a risk to public safety

DISCUSSION

Residue from the thinning trial will be retained at all treatment sites up to benchmark levels. These benchmark levels have been identified where it represents the level of coarse woody debris in a stand of comparable natural ecosystem (of river red gum forest) exhibiting relatively little evidence of modification since post-European settlement. The level of residue is not planned above what would occur naturally.

Additional residue exceeding this amount will be stockpiled for use by a domestic firewood program operated by NSW National Parks and Wildlife. The residue may be used for re-snagging or other biodiversity benefits.

This residue will not be 'piled' at these sites, but instead spread out to allow for the safe collection by domestic firewood gatherers.

RECOMMENDATIONS

- No action required

ISSUE NO: 35

ISSUE: Forestry Corporation of NSW were not consulted adequately

DISCUSSION

Consultation with Forestry Corporation staff was undertaken at local and regional levels. Forestry Corporation staff expressed concern that there was a potential missed opportunity to recover planning and operational costs by not selling the surplus thinnings commercially and that the trial would encourage harvesting contractors away from operations in State Forests, which would likely impact on local sawmilling and commercial firewood businesses.

During these discussions Forestry Corporation staff also expressed that they would not be interested in being part of a trial program.

RECOMMENDATIONS

- No action required