NSW GOVERNMENT

In association with:

SAVING OUR SPECIES

Saving the southern bell frog

An education resource for Years 3 to 6

environment.nsw.gov.au/sos

Photography, front cover: Southern bell frog (David Hunter/OEH)

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Contents

Did you know?

Southern bell frogs are olive to emerald green in colour while the groin and backs of their thighs are bright blue.

Photography: Southern bell frog (Helen P Waudby/OEH)

Introduction

This education resource has been developed to provide an opportunity for students to learn about the southern bell frog (*Litoria raniformis*), a threatened Australian species.

Unit description

'Saving the southern bell frog' provides a comprehensive unit of work focussed on:

- frogs and their habitat
- southern bell frog physical characteristics and adaptations
- threats to, and recovery of, southern bell frogs.

The resource is aimed at students from Years 3–6 and can be used either as a whole unit or as separate individual activities. Some information sheets and activities may also be appropriate for younger or older students.

Students may be unfamiliar with some of the scientific terms in the unit. We have provided definitions in this document and the supporting presentation for teachers to develop the scientific literacy of their students.

NSW syllabus

Included in this resource are information sheets and activities for a range of abilities that may be suitable for students in any year level as determined by their teacher. To assist teachers, the following details have been included in each activity description:

- the targeted Stage (year level) of the activity
- syllabus outcome codes for key learning areas– primarily Science and HASS (Humanities and Social Sciences)
- cross-curriculum priorities
- general capabilities that are applicable to student learning.

Supporting documents

This resource has one key supporting document, the 'Learning about southern bell frogs of NSW' interactive presentation. This presentation can be used to support many of the activities detailed in the education resource. It can also be used by students to support further research.

Additional resources and websites are listed on the back cover. These sites have been chosen to support further learning about the southern bell frog and other Australian frog species.

The following fact sheets have been prepared to provide critical background information about frogs generally and the southern bell frog. It is recommended that teachers read these prior to conducting the lessons. They can also be delivered to students conducting further research as part of this unit of work.

Above photos:

Southern bell frog
(David Hunter/OEH)

Checking for tadpoles
(Helen P Waudby/OEH)

Moira grass wetland habitat
(Helen P Waudby/OEH)

Did you know?

Australia supports over 200 native frog species and one introduced toad species.

Photography: Southern bell frog, juvenile (Helen P Waudby/OEH)

All about frogs

Unique creatures

Frogs as environmental indicators

Frog skin is water permeable, which means that it easily lets water in and out. Frogs can absorb oxygen through their lungs, but also through their skin and the lining of their mouth. When out of the water frog skin is kept moist by mucous membranes, which help with oxygen absorption.

Frogs have a two-phase life cycle. They start life in the water as an egg and then hatch into a tadpole. They slowly absorb their tail and develop legs (the aquatic phase). This process is called 'metamorphosis'. Once their tail is fully absorbed and their legs are fully developed, they are considered to be frogs (the terrestrial phase).

Since their skin is so permeable and because they spend part of their life cycle in the water and on land, frogs can be affected by pollutants in the environment. These attributes make them good indicators of the health of the local environment.

Sending out the call

Frogs sing loudest during their reproductive season. The calling frogs are males who are trying to attract females and are also warning other males to keep their distance. The louder the call, the more females the male is likely to attract.

Every frog species has a different call, which means we can usually work out what frog species is calling just by listening to it. While frogs do call during the day, they are mostly nocturnal, so frogs are especially noisy at night.

Surviving the dry

Australian frogs have adapted to many different habitats, including tropical rainforests, deserts, alpine areas, and semi-arid rangelands like those of the NSW Riverina. Frogs can also live in artificial environments, such as buildings, backyard ponds, farm dams, irrigation channels, and irrigated crops.

Arid and semi-arid zone frogs have several ways of surviving long periods of dry weather and high temperatures. Some species store large volumes of water in their body before burrowing deep underground, some move into deep crevices and remain largely dormant until the next rain arrives and others move through natural and artificial water channels to 'chase' water as wetlands dry up. Some frog species, like the southern bell frog, need permanent water sources to live in during dry times.

Frogs are food for many other animals, including reptiles, birds, fish and even other frogs. They play important roles in Australian ecosystems.

Common eastern froglet

David Hunter/OEH

Tree frogs and southern frogs

In Australia, two of the largest frog groups are called 'tree frogs' and 'southern frogs'. Tree frogs tend to have very obvious expanded pads on the tips of their fingers and toes, which help them with climbing. Southern frogs mostly have very simple, pointed fingers and toes with no pads, and don't tend to climb. Southern bell frogs are actually classed as tree frogs even though they spend most of their time on the ground or in the water!

On the menu

The tadpoles of most frog species eat algae, micro-organisms, and plant matter. Adult frogs are mostly carnivorous, eating insects and other invertebrates (animals without backbones). However, some frog species will eat vertebrate (animals with backbones) animals too, including other frogs, lizards and small mammals.

Toxic skin

All frogs have glands in their skin that can produce different compounds that cover the skin – some can be toxic. These compounds have evolved to deter a whole range of organisms that might infect the skin of frogs, such as bacteria, fungi and other animals that might eat the whole frog, such as snakes.

Having plenty of native floating vegetation is important for supporting lots of frog species

Helen P Waudby/OEH

Top: Seasonally-flooded river red gum wetland

(Helen P Waudby/OEH)

Bottom: Wavy marshwort (*Nymphoides crenata*) provides great floating habitat for frogs

(Helen P Waudby/OEH)

Saving our frogs

Frogs can be sensitive to changes in the environment, including pollution, and are sometimes called 'bio-indicators'. They are most vulnerable to pollutants when in the egg and tadpole stages. Changes in their population may indicate that something is happening in the local environment.

Frog populations in Australia face a number of threats. Some of these threats include pollution of wetlands and waterways, and changes to water regimes and aquatic vegetation (which frogs rely on) from urbanisation, land clearing, and river regulation. Other major threats include climate change and disease.

Over the past 50 years, the number of threatened and extinct frogs has increased dramatically across the world. Currently, 29 of Australia's frog species are listed as threatened under the national *Environment Protection and Biodiversity Conservation Act 1999*, including the southern bell frog.

Frog scientists and conservationists are working hard to secure the future of Australia's frog species. Conservation biologists and wetland ecologists with the NSW Government have been working on programs to save many frog species for several decades.

Water for frogs

The NSW Government has been delivering water for the environment to rivers and wetlands on private and public land for over 15 years. Healthy rivers and wetlands are important for supporting populations of frogs and other native wildlife.

Water for the environment is helping to maintain, restore and reconnect important habitat for threatened frog species, like the southern bell frog. Scientists are monitoring the responses of frog, fish, bird and plant populations to water for the environment to ensure it is being delivered in the best possible way in the long term.

Chytrid fungus

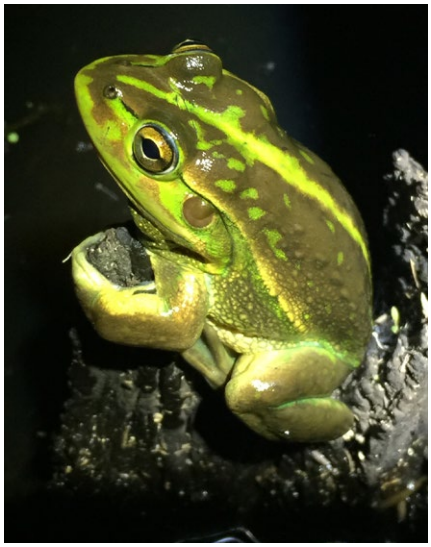
Chytrid fungus (pronounced *kit-rid*) attacks keratin in the frog's skin. As frogs use their skin in respiration, chytrid fungus makes it difficult for the frog to breathe. The fungus also damages the nervous system, affecting the frog's behaviour.

Chytrid fungus is probably transferred by direct contact between frogs and tadpoles, or through exposure to infected water. The disease may not kill frogs immediately, and they can swim or hop to other areas before they die, spreading fungal spores to new ponds and streams. This means it is very important not to move frogs from one area to another.

It is also important to clean wet or muddy boots and tyres, and fishing, camping, gardening or frog-surveying equipment before taking it into new areas, to minimise the risk of spreading chytrid fungus.

Southern bell frog

(Litoria raniformis)



Top: Adult southern bell frog showing bright blue thighs
(David Hunter/OEH)

Middle: Adult southern bell frog with emeralg green and dark olive colouring
(Helen P Waudby/OEH)

Bottom: Southern bell frog eating a barking marsh frog
(Helen P Waudby/OEH)

Conservation status

The southern bell frog is a threatened species classified as endangered in New South Wales under the *Biodiversity Conservation Act 2016.* Once, southern bell frogs were found across much of the state's southern tablelands and slopes. Now, the only known populations in New South Wales are found from about west of Deniliquin out to the South Australian and NSW border.

The distribution (places where they are found) and abundance (numbers of frogs) of southern bell frogs have been reduced a great deal over the past 20–30 years. Originally, this decline was probably mostly related to disease caused by chytrid fungus, which affects lots of frogs all over the world. Nowadays, southern bell frogs in New South Wales are threatened because river regulation means that many of the wetlands in which they breed no longer receive regular flooding and drying regimes. Fortunately, we can help fix this problem by ensuring water for the environment is supplied to wetlands at the right time of the year and for the right amount of time (about mid-spring to mid-summer) to help them breed.

Description

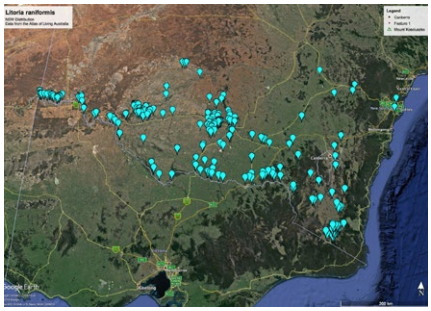
Adult southern bell frogs are large, measuring about 55 to 110 mm in length. The striking patterns and colours on their backs are usually olive to emerald green with irregular dark-brown or gold markings. Their backs are quite warty and a pale green stripe runs down the middle. In adult frogs, the groin and backs of their thighs are bright blue. Their bellies are white. Their toes are webbed and they have small toe-pads compared to some frog species. While they are officially classified as a tree frog, southern bell frogs spend most of their time on the ground!

Call

Southern bell frogs have a very distinctive call that sounds a little bit like a motor bike (which is why they are sometimes called 'growling grass frog' in Victoria). Their call sounds like a drawn out 'waaaaaah, waaaaaaah' followed by quick pulses of 'rah-rah-rah-rah-rah'. Listen to their call and see if you can copy it. If you stand at a wetland and call loudly (or rev the engine of your car), they might just call back! Southern bell frogs are active during the day and night, but like most frog species they usually call more at night.

Diet

Adult southern bell frogs are not too fussy about what they eat. They mostly eat insects and other invertebrates (animals without backbones), but sometimes also eat other small vertebrates, such as frogs!



Top: Southern bell frogs, female (on left) and male (on right)
(David Paul/Museums Victoria)

Middle: Maturing rice crops can connect natural habitat
(Helen P Waudby/OEH)

Bottom: Distribution of southern bell frogs in NSW
(OEH)

Breeding

Only male frogs call. They do that to attract a mate to breed with. For southern bell frogs, calling normally starts from about mid-spring and continues into summer. Male frogs will call from among plants in the water or at the water's edge. Even though southern bell frogs are often brightly coloured, they blend in very well with the plants and can be hard to see. Sometimes, they can be surprised while basking in the sun next to the water's edge. They'll jump into the water when startled making a loud 'plop' as they land in the water. They like to use seasonally-inundated wetlands to breed in from about mid-spring to mid-summer.

Saving the southern bell frog

In south-western New South Wales, southern bell frogs breed in shallow wetlands that flood following high river flows, from spring to summer. At other times of the year, they live in permanent waterbodies like large rivers and creeks, and even farm dams or channels if they have good vegetation in them. In New South Wales, a threat to southern bell frogs is not having enough wetlands at the right time of the year to breed in. Putting water into natural wetlands gives southern bell frogs somewhere to breed (increasing their numbers) and helps them move between wetlands.

Having good connectivity among wetlands is important because it provides southern bell frogs with lots of other wetlands to go to if their wetland dries up, and because it helps them move around and breed with other southern bell frogs.

It's also important to make sure that the permanent waterbodies ('refuges') where southern bell frogs live during drought and outside of their breeding season have aquatic vegetation and fringing vegetation (the plants that grow around the edge of the water) and good-quality water. Keeping their habitat healthy by ensuring they have lots of connected wetlands with good vegetation will help us ensure that southern bell frogs survive into the future.

Things we can do to look after southern bell frogs:

1. Ensure there are lots of connected wetlands with good vegetation.
2. Manage stock access to wetlands so that vegetation is maintained in the water and around the banks.
3. Allow breeding wetlands to dry every now and then to kill pest fish like European carp and gambusia (these species sometimes eat tadpoles and/or can damage aquatic vegetation).
4. Ensure that irrigation channels, dams and other waterbodies have plenty of vegetation to support southern bell frogs.

Did you know?

Southern bell frogs are also known as growling grass frogs because of the 'waaaaaah' sound they make.

Photography: Southern bell frog (David Paul/Museums Victoria)

Teacher's notes

Interactive presentation

The 'Learning about southern bell frogs of NSW' interactive presentation plays sounds and has tap on icons that reveal further information.

Please note: You will require the latest version of Flash Player installed on your computer for the sounds in the presentation to work correctly. get.adobe.com/flashplayer/

Slide navigation

At the beginning and end of each part you have the option to pause and reflect, skip to another section, or just keep moving through the slides

Part 1: All about frogs

SLIDE 3 – Important for our environment

Frogs are amphibians. They are important for our environment.

They are very sensitive to changes in the environment because their skin is permeable – meaning it can let water in and out. If there is pollution in the water, frogs are one of the first animals to be affected.

Frogs can be called environmental indicators, because if there are no frogs around where they should be, something could be wrong with the environment.

SLIDE 4 – A frog's life cycle

A life cycle shows how an animal moves through different stages of development.

Frogs are unique animals. They start their life in the water as an egg before hatching into a tadpole. While they are living in the water they go through a process called metamorphosis (meta-more-fo-sis). This is when they change their body to survive on land.

They absorb their tail into their body, develop strong legs to walk or hop, and lungs to breathe. Once completed, they are called frogs.

What's another animal that goes through metamorphosis?

Caterpillar > Butterfly

SLIDE 5 – Wetland food chains

Wetlands are complex ecosystems that occur in many different sizes. They are either temporarily or permanently covered by water, natural or artificial, have still or flowing water and can be fresh, brackish (slightly salty) or salty.

Wetland plants and animals are part of food chains. A food chain is a 'chain' of organisms, through which energy is transferred (direction of the arrows). Each organism in the chain feeds on and obtains energy from the one preceding it.

Plants provide the energy for the herbivores (plant eaters) and omnivores (plant and animal eaters). The carnivores (meat eaters) then eat other animals in the food chain.

Food chain examples:

- Water plants > Snail > Frog > Heron
- Algae > Tadpoles > Fish

Yabbies are decomposers and turn waste into food for the plants.

Are there any other food chains?

What else could herons eat?

SLIDE 6 – Frogs in the wetland

This interactive slide identifies six different frog species that can be found in wetlands in south-west NSW. Aligned with Activity Sheet 1B, tap on each '+' symbol to reveal a photo of the frog and play its call.

Part 2: Southern bell frogs

SLIDE 9 – What does a southern bell frog LOOK like?

This interactive slide identifies seven features of the southern bell frog. Tap on each '+' symbol to reveal the feature:

- dull olive-brown to bright emerald green
- mottled back with brown-bronze blotches
- warty bumps on their back
- inner thighs can be bright blue
- 55–110 mm long
- white belly
- toes are webbed for swimming.

SLIDE 10 – What does a southern bell frog SOUND like?

Adult males make a distinctive long, growling call. In fact, male frogs are the frogs you're most likely to hear. Southern bell frogs will call mainly from spring to summer to attract a female. The louder the call, the more females they are likely to attract.

In Victoria, southern bell frogs are known as growling grass frogs.

SLIDE 11 – What does a southern bell frog EAT?

Adult southern bell frogs eat insects and other invertebrates. Invertebrates are animals that have no backbones.

They have also been known to eat small vertebrates (animals with backbones) such as other frogs.

Part 3: Southern bell frog habitat

SLIDE 14 – Where to southern bell frogs live?

Southern bell frogs are endemic to south-eastern Australia (meaning they are only found here).

They were found across much of New South Wales' southern tablelands and slopes, but their populations have reduced.

SLIDE 15 – Their natural environment

Southern bell frogs can live in a variety of natural and artificial wetland habitats, including swamps, lakes, streams, riverine floodplains, farm dams, garden ponds, quarries, irrigation channels and rice bays.

Where could southern bell frogs live in your local area?

SLIDE 16 – Where's Billy the southern bell frog?

Play *Where's Wally* with Billy the southern bell frog.

SLIDE 17 – Examples of habitat

This interactive slide identifies six habitats where southern bell frogs live. Tap on each '+' symbol to reveal a photo of the habitat.

Part 4: Threats and recovery

SLIDE 20 – Southern bell frog numbers

Southern bell frogs are a threatened species classified as endangered in NSW (numbers are so low they are close to becoming extinct).

The only known populations left in NSW are found west of Deniliquin to the South Australian border.

Their distribution (places where they are found) and abundance (numbers of frogs) have both reduced over the past 20–30 years.

What's another threatened species that you know?

Why do you think their numbers have reduced?

SLIDE 21 – Why are southern bell frogs threatened?

- River regulation means that key wetlands are no longer receiving regular flooding and drying.
- Removal of wetland habitat by clearing vegetation for agriculture and other developments as well as livestock trampling wetlands.
- Predation of tadpoles by exotic fish such as European carp and gambusia.
- Pesticides and chemicals entering the water.
- Chytrid fungus (pronounced kit-rid) covers the skin, suffocating frogs.

SLIDE 22 – Looking after southern bell frogs

- Have lots of natural and connected wetlands with good vegetation.
- Manage stock access to wetlands so that good vegetation is kept in the water and around the banks.
- Dry out breeding wetlands every now and then to kill pest fish like European carp and gambusia.
- Ensure that irrigation channels contain good vegetation.

SLIDE 23 – Research and conservation

Scientists are collecting data to find out how many southern bell frogs are around. They do this by conducting and reviewing surveys, audio recordings and reports of calls or sightings.

Activity descriptions

Activity 1: What I know about frogs

Description: Provide students with Activity Sheet 1A. Ask students to brainstorm what they currently know about frogs and write down short statements or words that describe their own knowledge. Have students record their own answers in a single colour pencil or pen. After 5 minutes (approximately), students share what they know with the entire class and these thoughts are written on the board for everyone to see. In a different colour pen or pencil, students add any new answers they didn't have on their activity sheet.

Ask students:

- Have you seen many frogs?
- Have you heard many frogs?

Point out that we don't always see frogs because they are small, largely nocturnal, hide among plants and water and are camouflaged to avoid being seen. However, we hear them when the males are calling for a female, so they can breed. The louder a male frog calls, the more impressive he is to a female. Each frog has a unique call to distinguish it from other species of frogs in a wetland.

Run through 'Part 1: All about frogs' of the interactive presentation. Provide students with Activity Sheet 1B. They will use this sheet to create their own frog call dictionary. Students are introduced to six frogs that can be heard in wetlands during spring and summer. Each student listens carefully to the sound tracks being played on the interactive presentation. They need to record on their activity sheets what they think it sounds like by using sounds they are familiar with – for example knocking on a door, a motorbike, a witch's laugh, a dog barking.

Extension: Get students involved in the Australian Museum's FrogID Project. The FrogID app is available for Apple and Android devices and is used to record and identify frog calls across Australia. If you have frogs around your school, you can take part in their school activities. A series of resources is also available online to support teaching and learning about frogs. Visit: www.frogid.net.au/schools

Extension: Using the diagram as a base, make a 3D plasticine model of a frog. This can be completed in conjunction with Activity 2 and student make a 3D model of a southern bell frog.

Activity 1 overview

Students determine their current level of knowledge about frogs and create a frog call dictionary.

Stage

2 and 3 (Years 3–6)

Syllabus outcomes

ST2-11LW

ST3-10LW

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Resources

'Learning about southern bell frogs of NSW' interactive presentation – ensure sound is active

Activity Sheets 1A, 1B

Tablets with the FrogID app installed

Plasticine

Activity 2 overview

Students are introduced to the southern bell frog, its physical features, habitat, threats and conservation measures.

Stage

2 (Years 3–4)

Can be completed by Stage 3 as an intoduction lesson.

Syllabus outcomes

ST2-11LW

GE2-3

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Literacy

Resources

'Learning about southern bell frogs of NSW' interactive presentation – ensure sound is active

Activity Sheets 2A, 2B

Activity Sheet 1A

Plasticine

Activity 2: Southern bell frogs

Description: Reflect on what students know about frogs by playing 'Heads down, thumbs up'. Students sit with their heads on the table, eyes closed, and make a 'thumbs up' action to what they believe are true statements, or a 'thumbs down' action to false statements. Statements to test student recall can include:

- Frogs are important for our environment.
- Frogs are called environmental indicators.
- Frogs have fur.
- All frogs have a tail.
- Frogs go through metamorphosis.
- Tadpoles eat fish.
- Carnivores are meat eaters.
- All frogs are green.
- Wetlands are important ecosystems.
- Frogs eat insects.

Introduce students to the southern bell frog by running through Parts 2 to 4 of the 'Learning about southern bell frogs of NSW' interactive presentation. Separate the presentation into two sessions. As you review the presentation students will answer the questions on Activity Sheets 2A and 2B.

In the first session, run through 'Part 2: Southern bell frogs' and students complete Activity Sheet 2A. This activity raises awareness of the physical characteristics of the southern bell frog. At the end, leave the slide on the screen of the southern bell frog with its descriptions around it. Students can use this slide's photo to draw their own annotated diagram of the frog.

Session two looks at the habitat, threats and measures being taken to conserve this species. All the answers to Activity Sheet 2B are located within 'Part 3: Southern bell frog habitat' and 'Part 4: Threats and recovery'.

After the presentation, students can create their own visual representation of what they have learnt about the southern bell frog by creating an artwork, writing a short story or poem, or developing their own fact sheet about the frog. Provide students with a copy of pages 10 and 11 of this resource for ideas and details.

Extension: Using the diagram from Activity 1 as a base, make a 3D plasticine model of a southern bell frog.

Activity 3 overview

Students are introduced to the term 'habitat' and the concept that animals need a variety of conditions in which to survive. Students identify the habitat requirements of frogs, focusing on wetlands.

Stage

2 (Years 3–4)

Can be completed by Stage 3 as an intoduction lesson.

Syllabus outcomes

GE2-1

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Resources

Activity Sheets 3A, 3B

Paper

Butcher's paper or large cardboard

Markers

Paint

Craft materials

Activity 3: Frog habitats

Description: Part 3 of the interactive presentation introduces students to the term 'habitat' and where the southern bell frog lives. In this activity, you will take a closer look at an animal's habitat.

Begin by asking the class the following:

- *Where do you live?*
- *Where do you sleep?*
- *Where do you get your food?*
- *Where do you get your water?*
- *Where do you spend your days?*

All of these locations are your habitat. It is where you live, where you find nourishment, places you use or visit on a daily basis. An animal's habitat is no different – a place to hide from predators, feed, drink, breed and sleep.

Using Activity Sheet 3A, have students think about the habitat requirements of a frog and write their answers on the lily pads. You might like to revisit the interactive presentation to focus on the southern bell frog's habitat.

Next, as a class you will be creating a southern bell frog habitat mural. Using large sheets of butcher's paper (or a roll of brown paper), draw the basic cross-section of a wetland. Use Activity Sheet 3B as a guide.

Assign each student an animal that could be found in or around the wetland. Their task is to find a picture of that animal on the Internet and learn about its habitat requirements. They then draw or paint a version on a piece of paper, cut it out and tape or blu-tac it to the mural where they think that animal is normally found.

Once completed, each student tells the class what they learnt about their animal's habitat. For example, a kangaroo needs grass to eat, shelter, and water to drink.

Activity 4 overview

Students are introduced to the term 'metamorphosis' and determine the life cycle of the southern bell frog. Students learn that every living organism has a life cycle of birth–reproduction–death and compare life cycles to identify the similarities and differences.

Stage

2 (Years 3–4)

Syllabus outcomes

ST2-10LW

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Resources

Activity Sheets 4A, 4B

Activity 4: Frog life cycles

Description: Introduce students to the term 'life cycle'. Ask them what they think it means. Every living organism has a life cycle of birth–reproduction–death. Think of your own life cycle – we're born, we grow up, we have children, we get old and we die.

Frogs have a different life cycle. They go through a process called metamorphosis. This means that they change how they survive by transforming from a tadpole – that lives and breathes underwater through gills and has a tail to swim (just like a fish) – to a frog – that lives on land, can use lungs to breathe and uses strong legs to move around.

- Can you name another animal that goes through metamorphosis? For example, maggot to fly, caterpillar to butterfly, freshwater salmon to saltwater salmon.

Using Activity Sheet 4A, students need to read through the story of Billy and Belle the southern bell frogs. They need to identify the stages in the southern bell frog's life cycle and draw and/or write the four key stages in the diagram.

- We've learnt that the southern bell frog is a threatened species, so if Belle can lay up to 4000 eggs each year, why don't we have southern bell frogs everywhere?
- What can happen during a frog's life cycle to stop them becoming adults and reproducing?

Provide students with Activity Sheet 4B. Discuss all of the concepts students have just learned, including life cycles. Students need to compare how a simple plant, mammal and frog life cycle compare to one another and identify their similarities and differences. This activity could be completed in pairs or as a class.

Activity 5 overview

Students are introduced to the term 'adaptation' and look at some of the adaptations of frogs and how those adaptations help the frog to survive its environment.

Stage

3 (Years 5–6)

Syllabus outcomes

ST3-10LW

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Literacy

Information and communication technology capability

Resources

Activity Sheets 5A, 5B, 5C

Activity 5: Frog adaptations

Description: Introduce the topic of adaptation by asking students to consider their own adaptations.

- *What helps you live your life?*
  Your legs help you walk and run.
  Your lungs help you breathe.
- *How do you adapt to cold weather?*
  Wear warmer clothes, stay indoors.
- *How do you adapt to warmer weather?*
  Wear fewer clothes, wear a hat, drink more water
- *How do other animals adapt to their environments?*
- *Are these adaptations physical or behavioural?*

Provide students with Activity Sheets 5A and 5B. Activity Sheet 5A explains some of the physical adaptations of frogs that help them to survive. Go through these adaptations as a class and students can record answers to Activity Sheet 5B as you discuss the information.

Activity Sheet 5C looks at more frog adaptations and asks students to think about how these adaptations assist the survival of frogs. This could involve small group discussion.

From all these classroom and small group discussions, students are encouraged to choose a single frog adaptation that interests them and represent it as a drawing/painting, poster, animation, or other form of visual display that helps explain how it assists a frog's survival. For example: frogs lay hundreds of eggs but not all of the eggs survive. This could be represented by a picture of the eggs being eaten by a predator or a wetland drying out before the eggs hatch. Once completed, students can present their visual display back to the class and describe why they chose that adaptation and how it helps a frog to survive.

Extension: Provide students with the following take-home question. Ask them to discuss the topic with their parents and report back to the class with what they think the answer might be. This could lead to further discussions about natural selection or evolution.

> If the environment changes do, or can, animals change their physical adaptations to help them survive?

Activity 6 overview

Students review the habitat of southern bell frogs and the threats to their habitat. Students analyse the impacts humans have on southern bell frog habitat and how these activities affect the survival of these frogs.

Stage

3 (Years 5-6)

Syllabus outcomes

ST3-11LW

GE3-3

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Resources

'Learning about southern bell frogs of NSW' interactive presentation

Activity Sheets 6A, 6B

Activity 6: Upsetting the balance

Description: Prepare students by reviewing Parts 3 and 4 of the 'Learning about southern bell frogs of NSW' interactive presentation. If this has already been completed, then a review of the term 'habitat' and the types of preferred habitat in south-west NSW is advisable. This will help students answer some of the questions on Activity Sheet 6A.

'Part 4: Threats and recovery' lists the key threats that are impacting southern bell frogs. For more threats, ask students to navigate the Office of Environment and Heritage website to see if they can find the species profile of the southern bell frog.

www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species

Once students have the threats listed, they need to determine whether they are caused by humans or if they are natural threats. As a class discuss the following:

- How many threats are caused or influenced by humans?
- Could some of these threats be avoidable?
- What can we do to help protect southern bell frogs?

Students are provided with a diagram and a scenario: 'Southern bell frogs need a network of wetlands to help them breed, find food, and to shelter in. In the following diagram, our southern bell frog is currently living in a large river, but she needs to move to her summer wetland to breed. The creek is dry, which stops her from easily moving from the river to the wetland. What can we do to help her make her way to the breeding wetland?'

Split the class up into small groups and provide enough time to consider the options. While this occurs, draw a version of the diagram on the board (or display the page on a SMART Board). After suitable discussion time, ask groups to report what their options might be and draw or describe these on the board.

Options can include:

- Support delivery of water for the environment to rivers so water will flow into the creek that connects with the wetland.
- Maintain farm dams and irrigation channels with good vegetation as a link for southern bell frogs to move through the landscape.
- Manage stock access to wetlands, especially during the spring-summer breeding period, to maintain good-quality vegetation.

Next, students are introduced to the term 'seasonal wetlands'. These wetlands are meant to dry out and fill up again when conditions are good. Managing seasonal wetlands for southern bell frogs is very important to support their breeding and help replenish their numbers.

Activity 7 overview

Students work through the five-step Sustainability Action Process to support southern bell frog conservation in their local community or at a nearby wetland. Students document their learning in a learning journal. This journal becomes a record of their understanding, idea development and project achievements.

Stage

3 (Years 5–6)

Syllabus outcomes

GE3-3

Cross-curriculum priorities

Sustainability

General capabilities

Critical and creative thinking

Personal and social capability

Civics and citizenship

Resources

Activity Sheet 7

Internet

Students are provided with Activity Sheet 6B. Having read the two scenarios they have to decide which scenario is the better choice, why they chose that scenario and why that choice will help the survival of the southern bell frog.

This activity is best accompanied by a visit from a technical expert who can talk about managing wetlands for southern bell frogs, or water for the environment.

Contacts include:

- Office of Environment and Heritage
  www.environment.nsw.gov.au/contact/AlburyNR.htm
- Murray Darling Wetlands Working Group
  murraydarlingwetlands.com.au
- Murray Local Land Services
  murray.lls.nsw.gov.au/our-region/contact-us

Extension: Students can use the ABC Pond Population Modeller to run scenarios on what would happen to the population of animals in a pond if conditions were changed. Students think about the species who will be affected and hypothesise the outcome, test their hypothesis and record what actually happens.

Activity 7: Southern bell frog action plan

Description: This extended activity is best achieved over several weeks to a term as an entire class project with tasks assigned to smaller groups. Alternatively, students could use this process as part of developing an extra-curricular 'Southern bell frog Action Group'.

Use the NSW Sustainability Action Process (see website listed below) to empower students to make an action plan for the conservation of southern bell frogs in your local community.

education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/sustainability/sustainability-action-process

Students should keep a learning journal as they go through the process to record their ideas, results and reflect on their own personal learning. The journal is for their own personal reflection and can include photos, drawings, sketches, notes, printed materials, etc. A class journal should also be kept, recording all the information that is relevant to the action plan.

Sustainability Action Process

Step 1: Make the case

All lessons in this resource have been developed to help students explore and understand the life cycle and habitat requirements of southern bell frogs. To develop a business case for why the local community should act on saving southern bell frogs, students should further investigate conservation issues and options available in their community. This would be supported by a field trip to a local wetland or known southern bell frog site.

Step 2: Explore

Students analyse the results of the case they have developed. Through group discussions, students identify the limitations within the school and community and decide what actions could be achieved. Suggested actions are community awareness raising about southern bell frogs, letters to water managers, working with your local council to look after a wetland area, getting involved in citizen science activities to record frog calls, inviting scientists to talk to the school about wetlands and southern bell frogs.

Step 3: Plan

Students develop a proposal that will convince the school principal to support their action plan. This plan needs to include why the southern bell frog has been chosen for this project, resources that can be used, people to get involved, cost, time and limitations. This proposal can be in the form of a video, PowerPoint presentation, document/report or whatever format the class decides will have the best impact.

Once approved, the plan needs to be communicated to the rest of the school.

Step 4: Take action

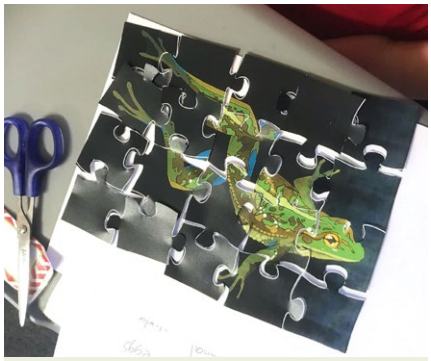
Students work together to put their plan into action. Each action needs to be recorded with a set of sequential steps, including the action's outputs (what was produced) and the results or lessons learnt from each step to measure the action's success.

In the group learning journal this could be represented by a table. For example:

Action	Create an awareness flyer			
Step		**Outputs**	**Completed**	**Result / Lesson learnt**
1	create flyer	2 page flyer	yes	needed more space for information
2	print flyer	100 flyers printed	yes	cost $1.30 each – $130
3	distribute flyer	80 flyers sent out	yes	20 flyers returned rethink how to get flyers delivered don't know if people are reading them

Step 5: Reflect

Students reflect on the results of the project, their learning and the sustainability action process. This is an important part of any good project to determine: Did we make the right choices? Could we have done something better? Can others learn from our successes or failures?



Southern bell frog jigsaw

Page 43 is a fun activity for all ages that can be completed at any stage. Print out the jigsaw pattern, in colour, on a thick piece of paper or card. Students cut out the individual pieces and reconstruct the jigsaw puzzle (see above photo).

Other activity suggestions

Southern bell frog find-a-word

Page 42 is a fun activity that can be completed at any stage. This find-a-word has 40 words/phrases that are used in the 'Learning about southern bell frogs of NSW' interactive presentation.

Alternative 1 – For older students, you could assign students with the task of finding definitions for each word/phrase.

Alternative 2 – Using some (or all) of the words, write them on flash cards and place face-down on the floor. Each student picks up a word card. Once all students have a card, provide them with 5–10 minutes to create one or two sentences that describe that word. Students present their word and sentence back to the class. This is a good activity for reflection and summarising what has been learnt.

Excursion

Take students on an excursion to a local wetland. Using tablets, cameras, sketch books or other resources, students develop a nature journal of the plants, animals and scenery of the wetland. Ask students to create a video or artwork based on their journaling. Additionally, ask students to pick one focal point of the excursion and create a poster or video that describes it. For example, a poster about the reeds and rushes or a video on why it's important to watch where you're walking to avoid treading on small plants and insects.

Construction

If you haven't got one, seek permission from the school to create a 'Southern bell frog bog' to attract frogs on the school grounds. Students can get involved in researching designs, calculating the number and costs of materials (such as plants), creating small signs about the 'Southern bell frog bog' to alert other students of its importance and safety requirements.

Outdoor activity or excursion

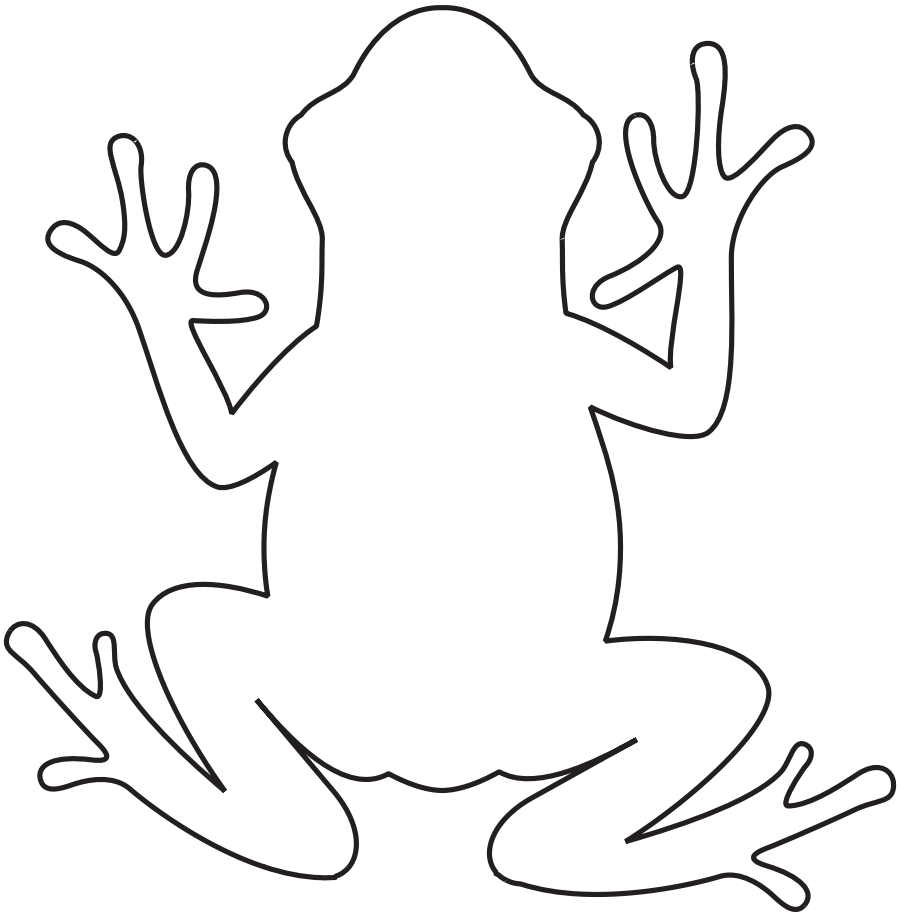
Conduct a waterbug activity either in the school grounds (using water samples collected from a wetland) or while on an excursion to a wetland. Frogs feed on the insects that fly around wetland areas or live in the water. Learning about how these invertebrates start their life in the water is a great activity for children. Contact Wirraminna Environmental Education Centre for more information about their waterbug incursion program.

What I know about frogs

What do you know about frogs?

Do you know about their shape, colour, size or where they live?

Write what you know around the frog below.



My frog call dictionary

We don't always **SEE** frogs, but we can **HEAR** them.

You are going to make your own frog call dictionary by describing what you think these six frogs sound like. Use sounds you are familiar with.

chicken clucking · creaking door · dog bark or yapping · squelch · honking horn · duck quacking · knocking · squeek · motorbike

Southern bell frog

Litoria raniformis

A large frog
55–110 mm long.

Sounds like:

. . . . . .

Barking marsh frog

Limnodynastes fletcheri

A medium frog
40–45 mm long.

Sounds like:

. . . . . .

Spotted marsh frog

Limnodynastes tasmaniensis

A small to medium frog
35–45 mm long.

Sounds like:

. . . . . .

Giant banjo frog

Limnodynastes interioris

A large burrowing frog
60–90 mm long.

Sounds like:

. . . . . .

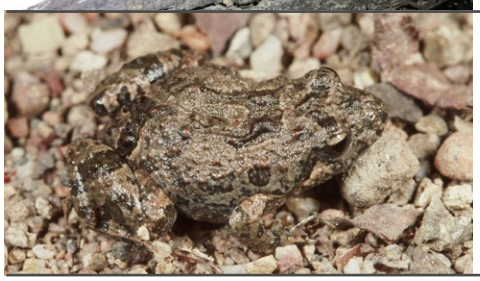
Peron's tree frog

Litoria peronii

A medium to large frog
45–65 mm long.

Sounds like:

. . . . . .



Plains froglet

Crinia parinsignifera

A small frog
20–30 mm long.

Sounds like:

. . . . . .

Describing southern bell frogs

Activity Sheet 2A

Find the answers to the following questions in the 'Learning about southern bell frogs of NSW' interactive presentation – Part 2.

1. How big are southern bell frogs?

. . . . . .

2. What do they have on their backs?

. . . . . .

3. Describe what they sound like.

. . . . . .

4. What is another name for the southern bell frog?

. . . . . .

5. They eat invertebrates. What is an invertebrate?

. . . . . .

6. They sometimes eat small vertebrates. What is a vertebrate?

. . . . . .

7. Draw your own southern bell frog and include notes about its appearance. Use the slide 'What does a southern bell frog LOOK like?' as a guide.

Saving southern bell frogs

Activity Sheet 2B

Find the answers to the following questions in the 'Learning about southern bell frogs of NSW' interactive presentation – Parts 3 and 4.

1. Southern bell frogs are **endemic** to south-eastern Australia. What does this mean?

. . . . . .

. . . . . .

. . . . . .

2. List three types of **habitats** southern bell frogs live in.

. . . . . .

. . . . . .

. . . . . .

3. Southern bell frogs are classified as endangered in NSW. What does **endangered** mean?

. . . . . .

. . . . . .

. . . . . .

4. What does **distribution** mean?

. . . . . .

5. What does **abundance** mean?

. . . . . .

6. What are the five key **threats** to southern bell frogs?

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

7. Name **two actions** that can be achieved to look after southern bell frogs.

. . . . . .

. . . . . .

. . . . . .

. . . . . .

8. Who is conducting **research** into southern bell frogs?

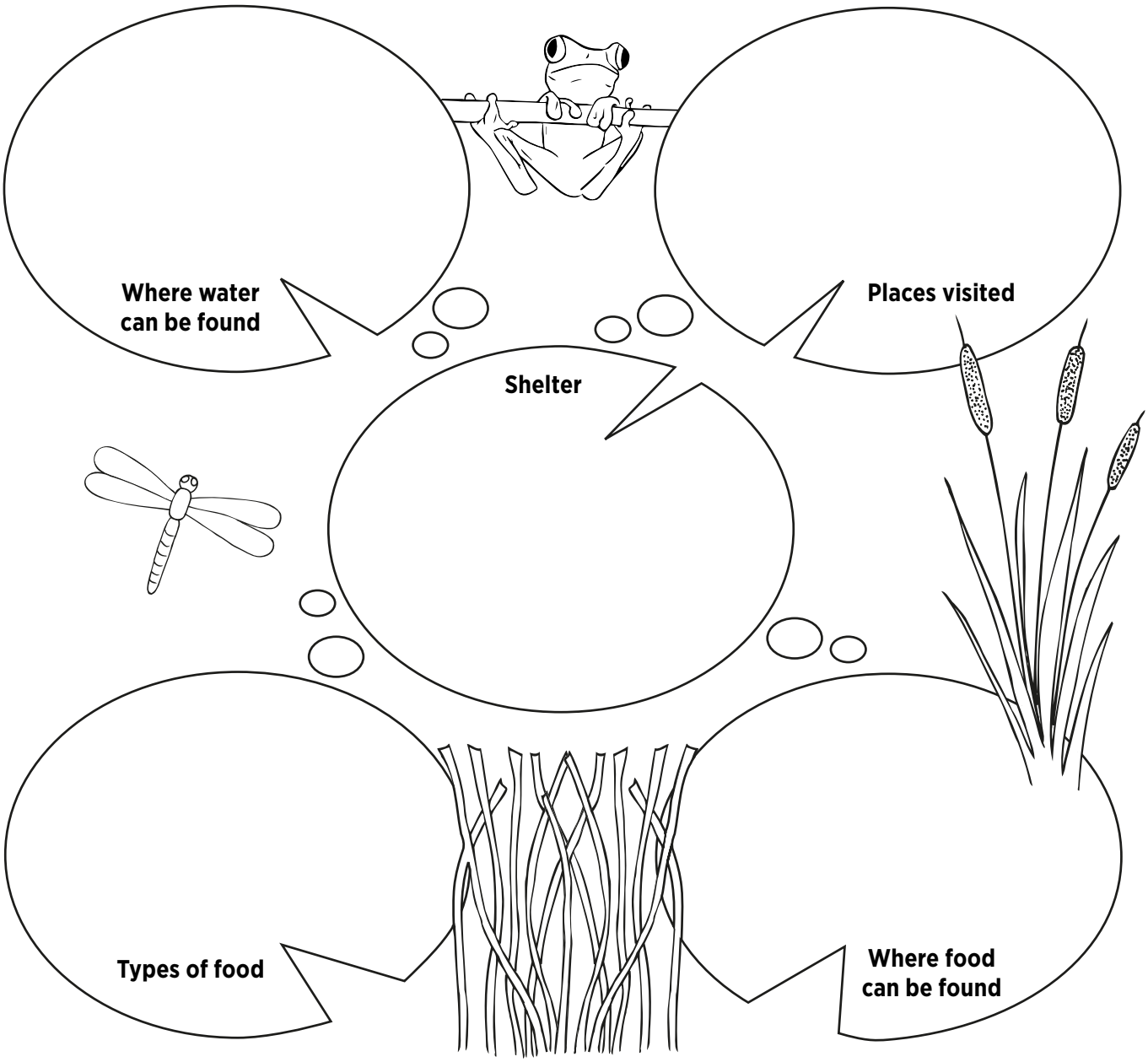
. . . . . .

Frog habitats

An animal's **HABITAT** includes all the places an animal lives in and uses to survive day-to-day. For example, animals need places to hide from predators, feed, drink, breed and sleep.

Think about where you live, get your food and water, spend your time during the day and go to on weekends. All these areas are included in your habitat.

Imagine you are a frog and you live in a wetland. Where would you sleep and find food? Do you move to other wetlands or travel in streams? Write your answers in the lilypads to describe your froggy habitat.



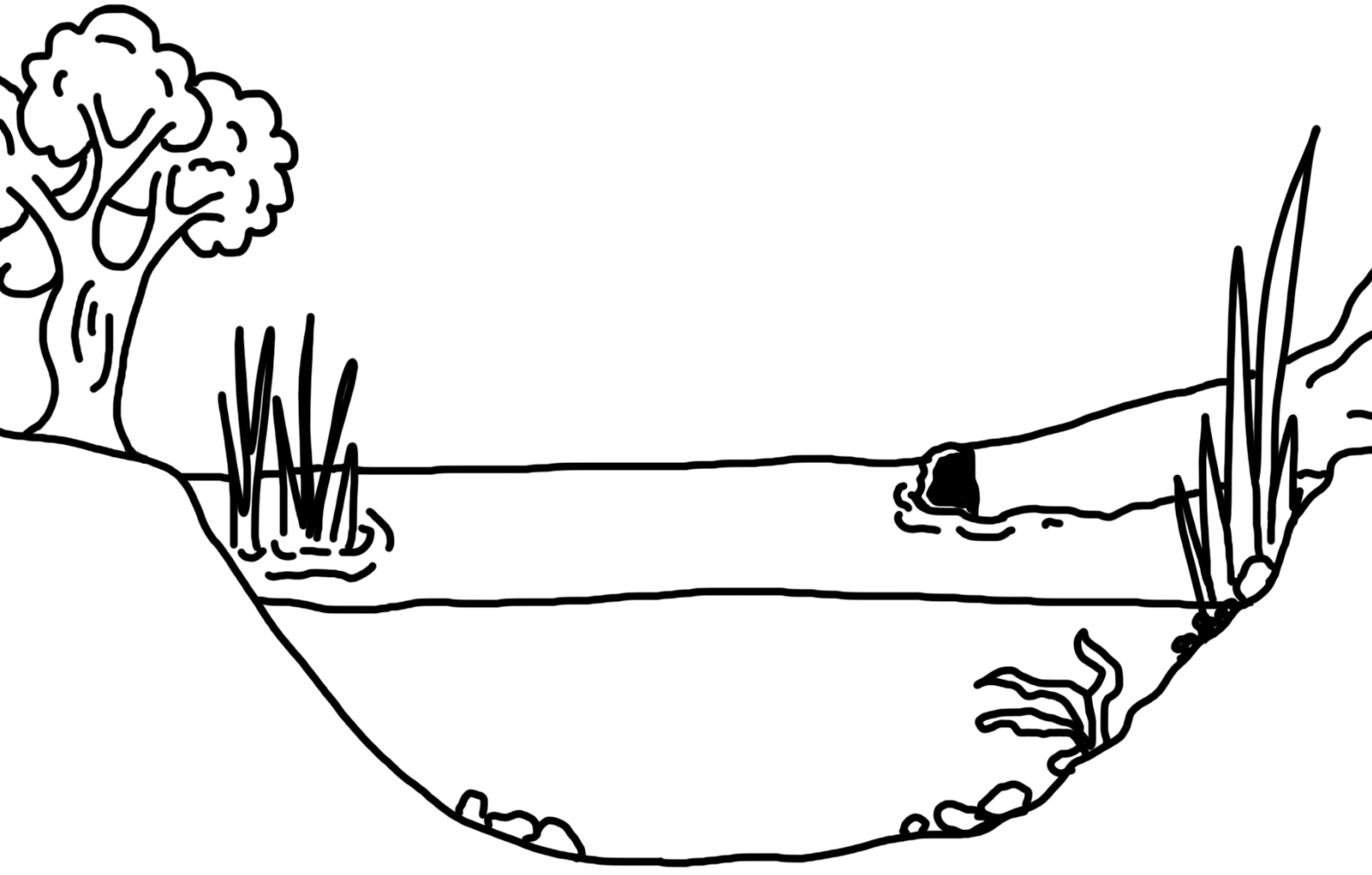
Wetland mural

Wetlands are very important. They provide homes to many animals including birds, insects, frogs, reptiles, small mammals and fish.

Using the cross-section below as an example, draw or paint a wetland on a big piece of cardboard or butcher's paper.

Below are 15 animals that can be found in or around a wetland. Find photos of these on the Internet and draw or paint them on separate pieces of paper. Cut them out and place them in the correct spot on your mural backdrop.

Golden perch	Whistling kite	Microbats
Dragonfly	Red-bellied black snake	Small lizard (skink)
Tadpoles	Pacific black duck	Eastern grey kangaroo
Squirrel glider	Spoonbill	Southern bell frog
White-faced heron	Snails	Spiders



Life of a southern bell frog

An animal life cycle shows how it moves through different stages of development. Frogs have very interesting life cycles as they go through a process called **metamorphosis** where they change from a tadpole into a frog.

Read the story about 'Billy and Belle the southern bell frogs" and see whether you can make a life cycle for the southern bell frog in the diagram below. Include time of year, weather events and drawings to support your life cycle diagram.

Billy and Belle the southern bell frogs

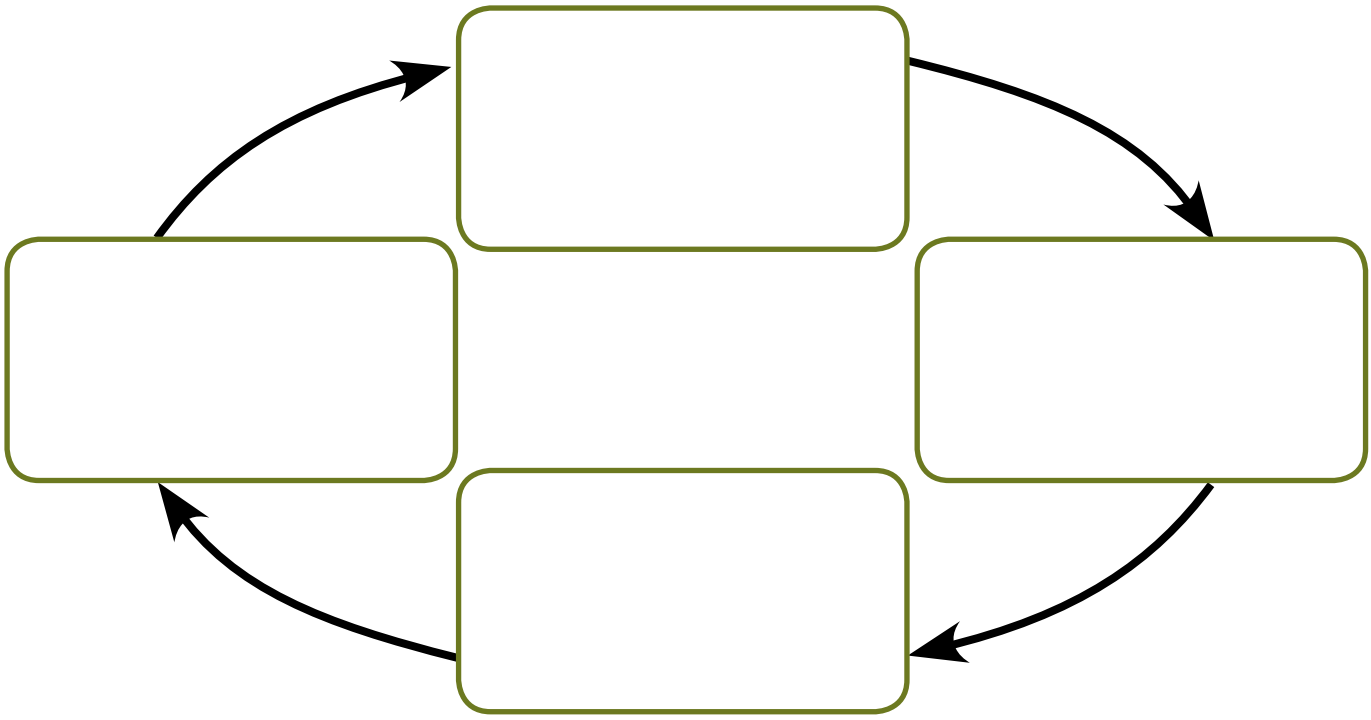
Water flows from the river into a local wetland. Black box trees and lignum shrubs line the banks of the wetland. Giant spike-rush and floating water lilies grow as the wetland fills. Nearby, a farmer tends their rice crop

It is mid-spring and Billy the southern bell frog is looking for a mate. As the wetland fills, he sits among the grasses on the edge of the wetland and starts calling: 'waaaaah, waaaaaah... rah-rah-rah-rah-rah'. Billy calls well into the summer months, trying to find a female southern bell frog to breed with. Eventually, he attracts the attention of Belle.

There is a crack of thunder and the summer rains begin to fall and soon Billy and Belle's wetland fills with water and floods. Now's the time to mate.

Belle lays up to 4000 eggs within days of the wetland filling. The floating egg raft sinks as the tadpoles form. The tadpoles hatch within 2–4 days after the eggs are laid. They have to survive the coming months of metamorphosis on their own. Metamorphosis is the process of changing from tadpoles into frogs and for southern bell frogs can take 3 months to a full year if conditions are not suitable. During this transition the tadpoles will grow legs, develop lungs, get bigger and eventually lose their tail.

Billy and Belle have achieved their goal of successfully creating another generation of southern bell frogs. As it dries, they will move to another wetland. As summer ends, and all the wetlands dry, they will move to a river or dam, where they will stay until their breeding wetlands fill with water in spring or summer.

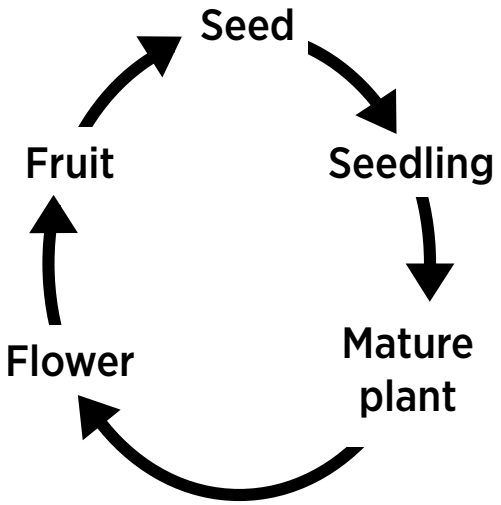


Comparing life cycles

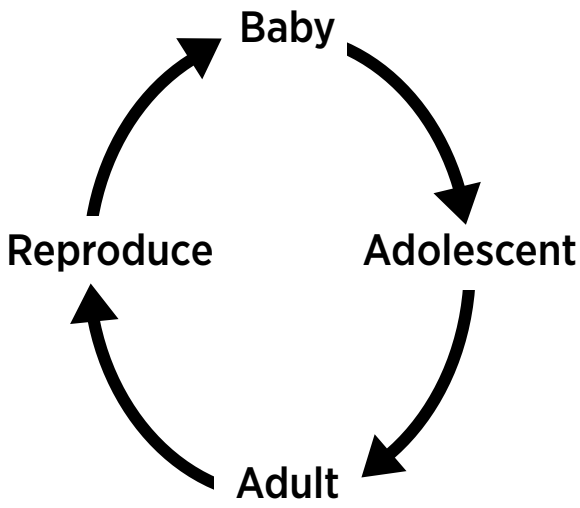
Below is an example of a life cycle for a plant and a mammal (such as a human). Compare the life cycles that you made up for a southern bell frog with the plant and mammal life cycles.

List any differences or similarities between the three life cycles.

Simple plant life cycle



Simple mammal life cycle



Plant	Mammal	Southern bell frog
Differences		
Similarities		

Facts about frog adaptations

What is an adaptation?

An adaptation is a special skill that helps a plant or animal to survive. Adaptations can be physical – how a plant's structure or animal's body changes. Adaptations can also be behavioural – how an individual or a community reacts to their surroundings or works together.

Many species adapt to their habitat to help them survive in difficult places, such as camouflage, only wandering about at night, feeding on particular plants or animals and lasting for long periods without food or water. Frogs have a number of adaptations for survival and below are just some of those adaptations that all frogs have.

The tympanum or ear

Frogs can hear very well using big round ears on the side of their head. Their ears are called the tympanum, which means drum because they have a membrane over the top of them that protects them in the water and acts like a drum to pick up sounds. Frogs can detect extremely high-pitched sounds with their ears and low-pitched sounds through their skin.

The tongue

Frogs have soft, sticky tongues that, unlike humans, are attached to the front of their mouths. This allows them to throw their tongues out of their mouths to stick to insects. The tongue then retracts pulling its prey back into their mouths.

Eyes

Frogs hunt on land by using their vision. They have very good eyesight that is based on movement. They can only see food or avoid predators if they see them moving. Frogs are able to make their eyes bulge out to be able to see many directions at once.

Frogs often blink while they are eating. They swallow their prey whole and push their eyes into their sockets, which helps push food down their throats.

Legs

Frogs have very powerful legs that can allow them to make huge jumps considering their size. They use coiled tendons, like in an archers bow, to jump long distances. Before jumping, the leg muscle shortens, loading energy into the tendon, which then recoils like a spring to propel the frog along.

Skin

A frog's skin is a very important organ. They absorb almost all of their water through the skin and some of their oxygen. They must keep their skin moist for these processes to work. If a frog's skin becomes too dry they have trouble absorbing oxygen and releasing carbon dioxide. If they are dry for too long, they will suffocate and die.

Some frogs, like the corroboree frog (below), have bright colours to warn predators of their toxic skin.

Smell

Frogs usually breathe through their nostrils with their mouths shut. They use their sense of smell during the breeding season to find a mate.

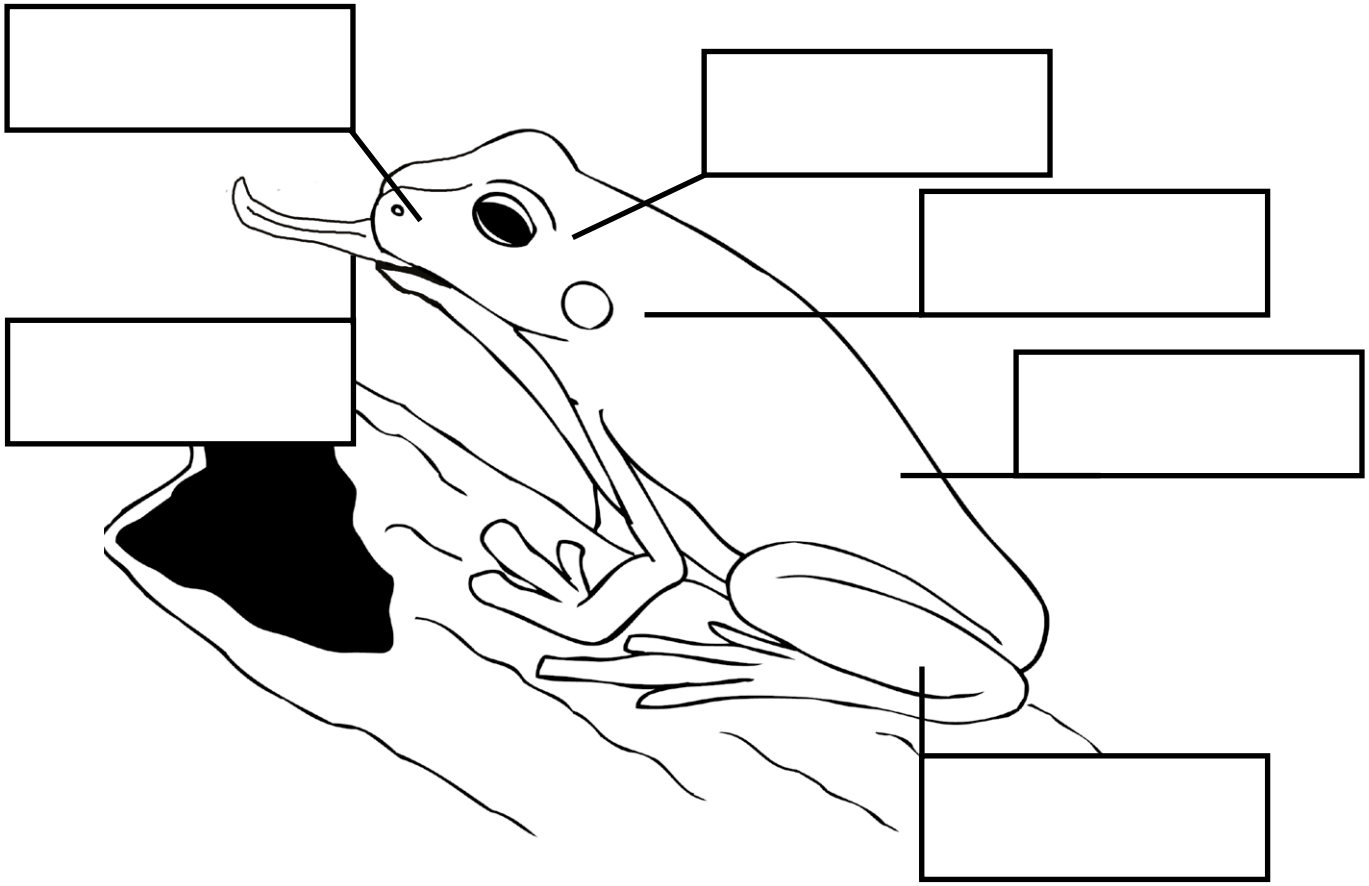
Most frogs use sensitive areas around their eyes and on their skin to detect chemical changes in the air given off by predators or food.

Southern bell frog eyes
David Hunter/OEH

Corroboree frog
David Hunter/OEH

Frog adaptations

1. Use Activity Sheet 5A to fill in the blanks on the frog diagram.



2. How do frogs breathe when they are underwater? . . . . . .

3. What is another name for a frog's ear? . . . . . .

4. What do frogs use to detect their food? . . . . . .

5. What's the difference between frog and human tongues? . . . . . .

6. How are frogs able to leap for long distances? . . . . . .

7. Why do frogs blink when they swallow? . . . . . .

More frog adaptations

1. Below is a list of other frog adaptations. How could these adaptations assist the survival of frogs? Record your answers.

Adaptation	Assists a frog's survival by...
Frogs call at different times of the year.	
Some frogs call during the day and some at night.	
Some frogs burrow.	
Only males call to attract females.	
Frogs lay hundreds or thousands of eggs at a time.	
Frogs are camouflaged.	
Some frogs can change colour.	
Some frogs have bright colours.	

2. Choose one frog adaptation and represent it as a drawing/painting, poster, animation, or another format that helps explain how it assists a frog's survival.

   For example: Frogs lay hundreds of eggs but not all of the eggs survive. This could be represented by a picture of the eggs being eaten by a predator.

Impacts on habitat

1. What is meant by the term HABITAT?

. . . . . .

2. What is the preferred habitat of southern bell frogs?

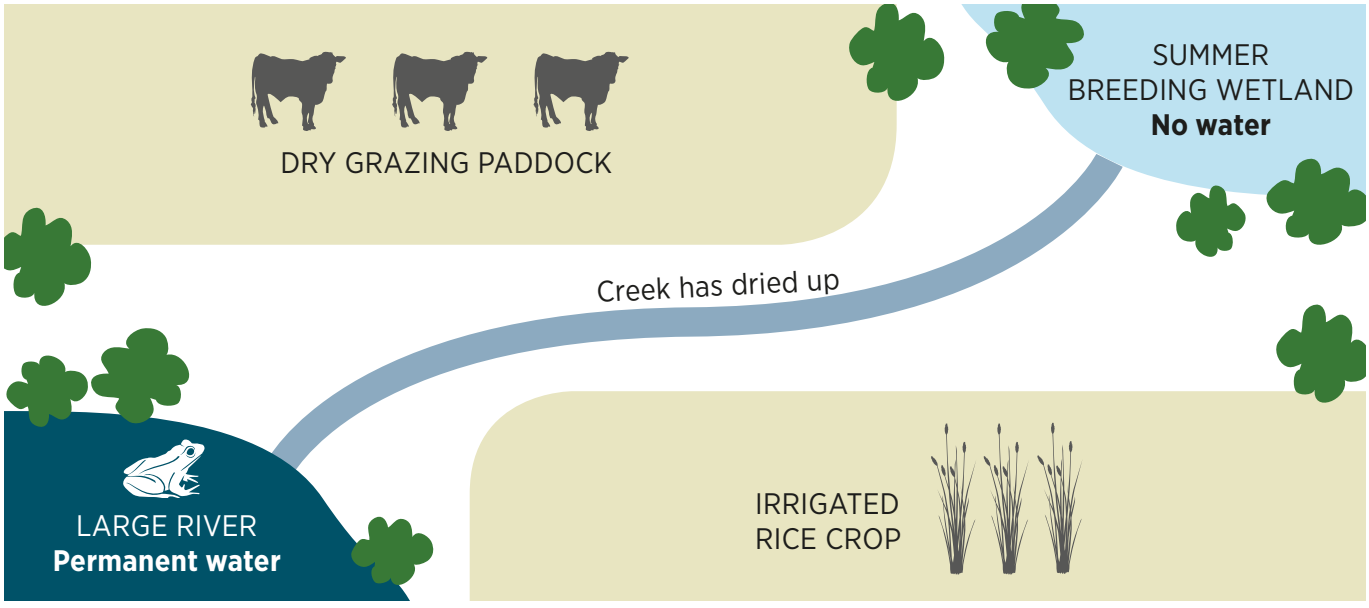
. . . . . .

. . . . . .

3. What are the current threats to the southern bell frog's habitat? Do you think these threats are caused by humans or are they natural? (tick the column)

Threats	Human	Natural

4. Southern bell frogs need a network of wetlands to help them breed, find food, and to shelter in. In the following diagram, our southern bell frog is currently living in a large river, but she needs to move to her summer wetland to breed. The creek is dry, which stops her from easily moving from the river to the wetland. What can we do to help her make her way to the breeding wetland?



Upsetting the balance

Southern bell frogs are a threatened species and they need our help to survive. They can live in and around seasonal wetlands, which are meant to dry out and fill up again when conditions are good.

One of the biggest threats to their survival is when wetlands don't receive water at the right time of year.

Below are two scenarios about how a seasonal wetland could be managed. You have to decide which scenario is better for the southern bell frog's survival.

1. Which scenario is the better choice?

Scenario A

On a property near Hay, the predicted spring rain didn't arrive and summer is going to be very dry.

There are some grasses still growing in the dry seasonal wetland on a local farm. The farmer decides to put cattle in there to eat the grass.

The farmer doesn't know that southern bell frogs have been in the area. They need the wetland to fill up so they can breed.

Some summer rains eventually come and the farmer keeps the cattle in the wetland to eat the new grass. The cattle trample the site and eat all the vegetation.

Scenario B

On a property near Hay, the predicted spring rain didn't arrive and summer is going to be very dry.

There are some grasses still growing in the dry seasonal wetland on a local farm. The farmer knows that southern bell frogs have been heard on the property so makes sure to get an allocation of water for the environment at the start of summer.

The water arrives and mimics the rain events that start the southern bell frog's breeding cycle.

The farmer also fences off the wetland so the cattle can't eat and trample the wetland habitat.

. . . . . .

2. Why did you choose this scenario?

. . . . . .

3. How will your choice help the survival of the southern bell frog?

. . . . . .

. . . . . .

Southern bell frog action plan

Southern bell frogs are endangered and they need help if they are going to survive. We have altered our natural environment to the point where they are struggling to find water, have more predators than before and are exposed to life threatening diseases.

All is not lost! We can make a difference in our local community by raising awareness of southern bell frogs and supporting the conservation of their habitat. You are going to work as a team to develop an action plan for southern bell frogs.

Step 1: Make your case for conservation

Build your case for conserving southern bell frogs further by finding more information about their plight, what is currently being done and who in your community can help.

BUILD YOUR CASE

Can we find more information about southern bell frogs? Where should we look? Who should we ask?

If we were to create the ideal habitat for southern bell frogs, what would it look like? Draw your ideal habitat in your learning journal.

Do we need to visit a southern bell frog site? What data should we collect if we visit a site? Who should come with us?

Can we change things in our local community to improve their habitat?

Step 2: Explore your options

Review your case and decide what action can be taken.
Use the following questions to guide the process.

ACTIONS TO TAKE

What actions have been done to conserve southern bell frogs already?

Who can help us?

What resources would we need to increase habitat?

What actions do we want to take?

How much time will it take?

How will we know if the changes we make have been successful in increasing southern bell frog numbers?

What might limit our actions?

Step 3: Develop your action plan

Develop a proposal to convince the school principal of your action plan. This plan needs to include why the southern bell frog has been chosen for this project, resources that can be used, people to get involved, cost, time and limitations.

Once approved, you will need to tell the rest of the school about your plan. How will you do this?

1. GOAL

Why have we chosen the southern bell frog?

2. ACTIONS

What do we intend to do? Outline the actions you will take.

3. SUPPORT

Who will be involved? Include any technical people from the community that could help, e.g. scientists, water managers.

4. TIMEFRAME

When will we do it? How long will it take? Create a timeline for your plan.

5. BUDGET

Are there any costs? What are they? Your teacher can help estimate costs, if there are any.

6. LIMITATIONS

Record any issues that could limit us in implementing this action plan.

Step 4: Take action

Work together to put your plan into action. Remember to follow the sequential steps you have identified, record what you produce (or intend to produce – outputs), monitor your progress and collect data to help measure your success.

OUTLINE EACH OF YOUR ACTIONS

For example:

Action	Create an awareness flyer			
Step		**Outputs**	**Completed**	**Result or lesson learnt**
1	create flyer			
2	print flyer			
3	distribute flyer			

Step 4: Reflect

Reflecting on your action process is an important part of any good project. Did you make the right choices? Could you have done something better? Can others learn from your successes or failures? Use the questions below to help your reflection.

TIME TO REFLECT

Did we achieve our goal of improving southern bell frog habitat in our local community?

Would our action plan help other schools protecting threatened species habitat?

How did we measure this?

How can we communicate our success and engage others to try our idea?

What could we have done differently to get a better result?

Thinking back on what was achieved, the most enjoyable part of the project was...

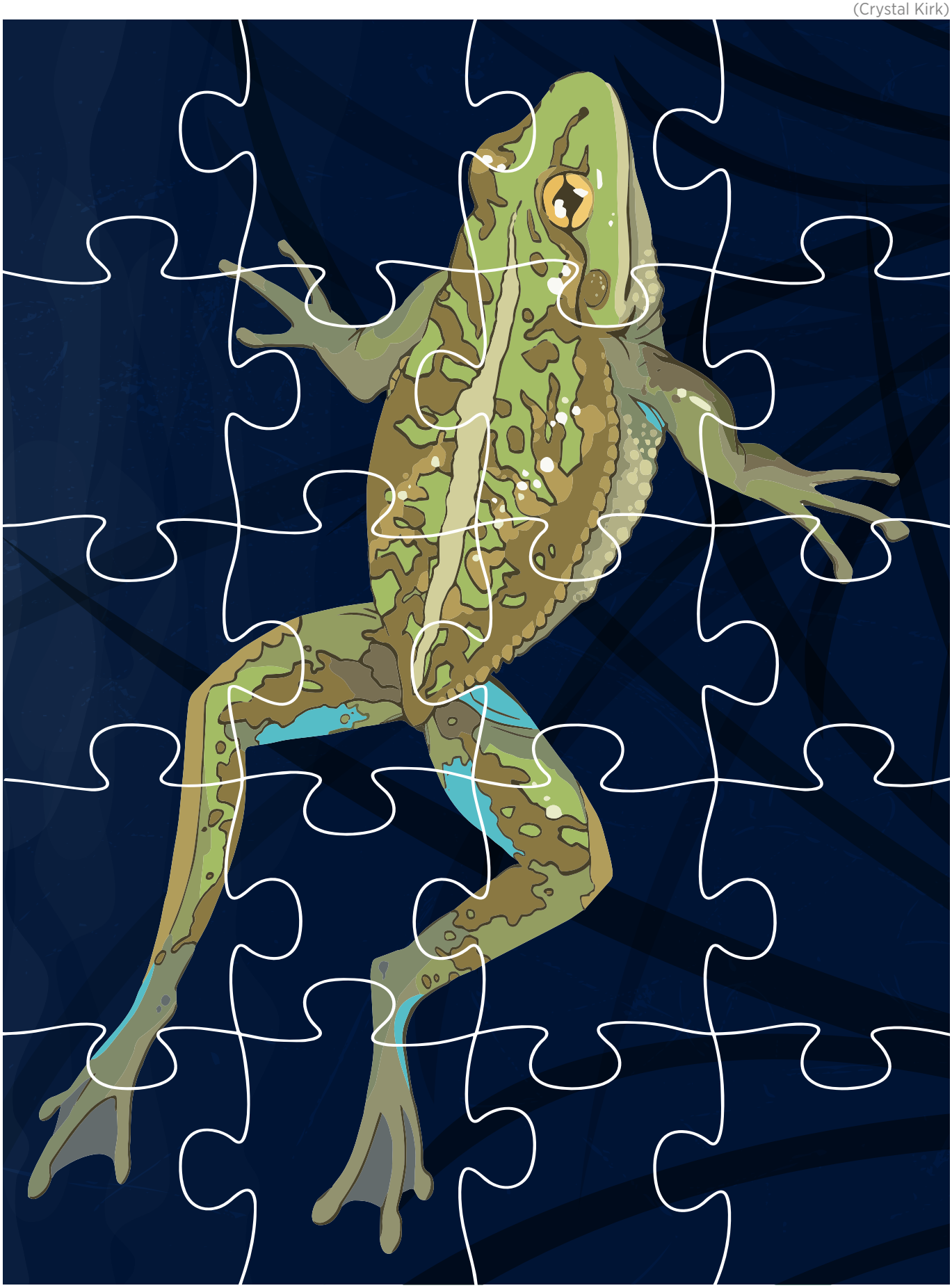
Southern bell frog find-a-word

D	G	O	O	D	V	E	G	E	T	A	T	I	O	N	C	E	C	C	E	N	P	F	P	I
S	I	O	Z	E	C	G	T	N	S	I	Y	R	J	R	Q	C	O	T	N	O	E	H	S	N
A	E	I	R	Q	Z	A	F	L	O	U	I	R	H	Y	X	N	E	G	V	I	S	V	T	S
R	B	R	B	F	D	X	A	E	C	I	M	I	G	Z	N	A	V	F	I	T	T	N	O	E
B	S	W	O	P	L	C	E	O	G	H	T	G	J	E	U	D	I	O	R	A	I	O	C	C
I	K	I	O	V	I	L	M	A	D	E	Y	A	C	J	T	N	T	O	O	V	C	I	K	T
T	N	L	S	M	I	N	E	E	U	P	I	T	D	N	U	U	I	D	N	R	I	T	A	S
H	E	D	E	O	I	N	R	B	O	D	E	I	R	E	Y	B	S	C	M	E	D	A	C	M
C	A	H	I	V	H	E	R	P	N	D	E	O	D	I	R	A	N	H	E	S	E	L	C	E
Q	C	B	O	C	G	P	U	A	W	R	H	N	S	E	D	P	E	A	N	N	S	U	E	T
G	H	R	I	N	A	L	R	E	C	C	E	C	E	G	C	F	S	I	T	O	I	G	S	S
P	E	X	A	T	A	T	T	O	R	D	N	H	A	T	O	O	U	N	A	C	S	E	S	Y
S	O	D	C	T	A	L	O	A	M	E	F	A	T	P	A	R	M	N	L	L	G	R	Y	S
O	N	U	I	O	A	T	E	R	W	A	J	N	Y	U	O	E	F	P	G	S	G	R	G	O
E	C	O	V	N	W	S	H	X	S	A	T	N	N	U	O	C	R	R	O	U	E	E	M	C
O	N	C	D	H	E	R	B	I	V	O	R	E	S	U	X	S	D	H	H	S	S	V	Y	E
D	I	S	T	R	I	B	U	T	I	O	N	L	M	O	S	T	S	I	T	N	E	I	C	S
E	N	D	E	M	I	C	G	O	R	F	S	S	A	R	G	G	N	I	L	W	O	R	G	F
S	E	T	A	R	B	E	T	R	E	V	N	I	E	P	H	E	M	E	R	A	L	D	S	H
D	U	R	E	D	N	A	L	T	E	W	Z	E	L	B	A	E	M	R	E	P	X	L	T	Y

Abundance
Carnivores
Chemicals
Chytrid fungus
Connected wetlands
Conservation
Decomposers
Distribution
Ecosystems
Egg
Endangered
Endemic
Environmental
Ephemeral
Food chain
Frogs
Good vegetation
Growling grass frog
Habitat
Herbivores
Indicators
Insects
Invertebrates
Irrigation channels
Metamorphosis
Omnivores
Permeable
Pesticides
Population
Predation
Research
River regulation
Scientists
Sensitive
Southern bell frog
Stock access
Tadpole
Threatened
Vertebrates
Wetland

Southern bell frog jigsaw

Southern bell frog artwork
(Crystal Kirk)



Additional resources

NSW Office of Environment and Heritage

Frogs, bell frogs, threats to frogs and Frogs of south-west NSW – booklet
www.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/frogs

Wirraminna Environmental Education Centre

Teaching resources and videos
Corroboree frog display
www.wirraminna.org.au

Australian Museum FrogID Project

www.frogid.net.au

Melbourne Water

Frog curriculum resources and wetland videos
www.melbournewater.com.au/community-and-education/teacher-resources

Enviro-Stories

Picture books written by kids about frogs
www.envirostories.com.au/?s=frog

Find out more about threatened species at:

www.environment.nsw.gov.au/sos