FrogID

EDUCATION RESOURCES

Australian Frogs

MAJOR PARTNER

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AUSTRALIAN MUSEUM

frogid.net.au

Information about Australian Frogs

Australia is home to about 240 species of native Amphibians, all of which are frogs. There are five families of frogs in Australia, each living in a range of different environments. These families are:

- **Tree Frogs**, the *Pelodryidae* can be divided into climbing frogs, ground-living frogs and water-holding frogs.
- **Ground Frogs** *Myobatrachidae* also live in a variety of different habitats.
- **Narrow-mouthed Frogs** *Microhylidae* live on the ground. Some of them have toe discs for climbing and most are walkers rather than leapers.
- **True Frogs** *Ranidae* have long hind legs which allow them to swim and leap well. There is only one species of True Frog in Australia – the Australian Wood Frog
- **Toads** *Bufonidae* have a different bone structure from other families of frogs. The introduced Cane Toad is the only toad in Australia.

Our frogs play an important role in Australian ecosystems, and one that has so far proven to be difficult to fill with other animals when frog populations disappear or dwindle. Frogs are key in energy flow and nutrient transfer within food webs. When frog populations are severely depleted, streams can become clogged with algae from lack of tadpoles, and there is a loss of an important and nutrient rich food source for predators.

The main threats to Australian frogs include:

1. **Habitat loss**
   - Urban development and overuse of natural resources means that the natural habitats of many Australian frogs are being severely depleted. This has detrimental effects on frog populations as they lose a habitat that was ideal for their living and breeding purposes without having time to adapt.
   - Even small-scale habitat loss from slow urban expansion can gradually deplete populations, something that can go unnoticed until it is too late.
   - In developed areas, frogs are often in direct danger from cars and other vehicles.

2. **Climate change**
   - Frogs are specially adapted to survive their natural habitat, relying on weather and seasonal patterns to complete their life cycle. Even a slight change in climate that would be overlooked by human populations can have significant effects on the life cycles and survival of certain frog species.

3. **Pollution**
   - Frogs have incredibly absorbent and permeable skin for the absorption of oxygen and release of carbon dioxide, as well as the absorption of water and regulation of salinity. Its skin does, however, make frogs very sensitive to pollution.
   - Even slight increases in water salinity can change the ecological health of waterways and have drastic effects on a frog's biological processes.
   - As their skin is so permeable, pollutants in the air and waterways will often affect frog populations first, making them good bio-indicators of the health of the environment.

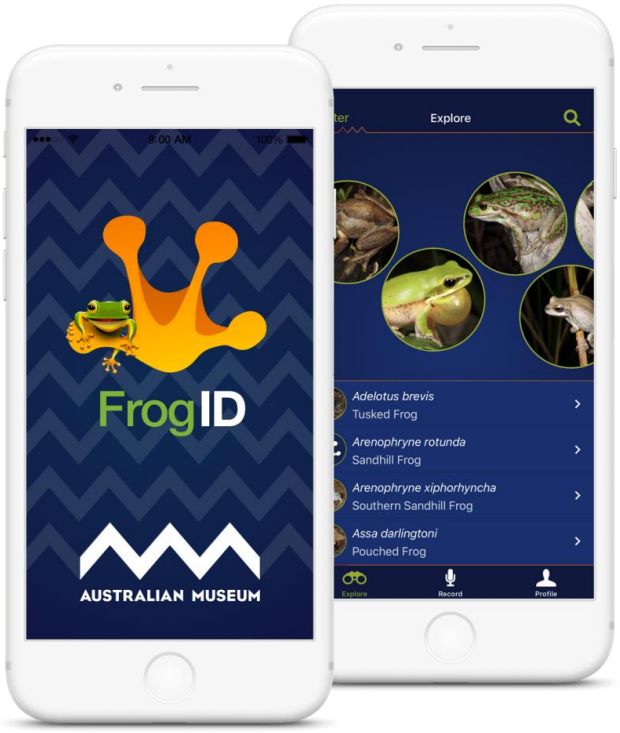
4. **Parasites and disease**
   - One of the most well-known causes of disease in frog populations in Australia and around the world is the amphibian chytrid fungus, a zoosporic pathogen, that affects the skin of amphibians.
   - Other fungal-like parasites such as the mesomycetozoeans – microscopic organisms which cause lesions on the skin, muscle and internal organs.
   - Parasites and disease can spread via the global wildlife trade as fish and amphibians that travel internationally are not vigorously checked.

5. **The Cane Toad**
   - The Cane Toad is an introduced pest and the only toad in Australia.
   - They present a potential threat to Australian frogs as competitors for food sources.
   - They poison native animals and may carry diseases that can be transmitted to native frogs and fishes.

What is FrogID?

FrogID is a national citizen science project that aims to make learning about Australian frogs, what is happening to them, and the importance of conserving frogs easy. With the FrogID app, people from all over the country can record frog calls and identify frogs in their area using their smartphones!

The app is also being used to collect data on the Cane Toad, allowing us to track its whereabouts, and to identify where frog populations are thriving and where they are threatened. Using FrogID, you can help scientists determine where frogs are most at risk of habitat loss, climate change and disease.



How to use the FrogID mobile app: https://www.youtube.com/watch?v=sl73oSP1MjE
Why Frogs are important FrogID: https://www.youtube.com/watch?v=KKzPq-gOQro

What's so important about frogs?

Frogs play a vital role in many food webs, as both predators and prey. Their role as predators of insects is a key factor in the eradication of millions of pests that could destroy valuable crops. As prey, they provide food for birds, fish, snakes, and other larger animals. Tadpoles can even act as a kind of filter by feeding on algae.

They are also key biological indicators of the health of the environment. Environmental degradation, climate change and disease have detrimental effects on frog populations. Their soft, absorbent skin often means that environmental changes, such as increasing pollution, are indicated early by declining populations and rising numbers of physical deformities.

By returning to sites where frogs have been recorded at different times and under different weather conditions, we can track changes in frog populations and habitats over time, and so gauge the effect of environment change on different frog species.

Data obtained through the app can also help us to track the spread of introduced Cane Toads.

Frog Conservation

Due to the various threats against frog populations and their rapidly decreasing numbers, conservation efforts have become vital to their survival.
Tracking frog populations by recording frog calls with the FrogID app will allow us to learn how different frog species are responding to their changing environments. Collecting this information and making use of it in conservation efforts could be crucial to saving Australia's frogs.

In urban areas, human development has reduced the natural habitat available to frogs. Building a frog pond in your school or backyard helps conservation efforts by giving frogs in your area somewhere to live, providing a haven from habitat destruction and pollution.

Frog adaptations

Frogs are especially adapted to the conditions that they live in. Many frogs that live in forests and rainforests have sticky toe discs that help them climb and keep them in place when resting on leaves and branches.
Frogs that live in arid areas have tough tubercles on their back feet to help them dig into the earth when burrowing. Frogs that swim have webbed feet to make them more efficient in the water.

Frog Research at the Australian Museum - Teacher Resource

1. Summary

Students learn about the specialities of some scientists at the Australian Museum. They understand what the career of a biological scientist is like, and how biology research occurs at the Australian Museum.

2. Objectives

- Students are introduced to scientific research.
- Students take on the role of a scientist and undertake research.

3. Curriculum links

- **Stage 1**
  - ACSSU211
- **Stage 2**
  - ACSSU073
  - ACSHE061
- **Stage 3**
  - ACSSU043
  - ACSSU094
  - ACSHE098
- **Stage 4**
  - ACSIS133
  - ACSIS140
  - ACSIS148
  - ACSHE223

4. Resources

- Video: An Interview with Dr Jodi Rowley, Curator, Amphibian and Reptile Conservation Biology (Herpetology) at the Australian Museum. Jodi Rowley appears from 5 min:41 sec until 11 min:16 sec (end of video) at: https://vimeo.com/180813509
- AMplify Podcasts – Dr Jodi Rowley in conversation with Australian Museum Director and CEO Kim McKay (in 2 parts):
  Part 1 – 15 mins: https://australianmuseum.net.au/blogpost/at-the-museum/amplify-episode-3-dr-jodi-rowley
  Part 2 – 15 mins 41 secs:https://australianmuseum.net.au/blogpost/at-the-museum/amplify-episode-10-dr-jodi-rowley-part-2
- Can frogs help combat the zika virus?: http://australianmuseum.net.au/blogpost/amri-news/can-frogs-help-combat-the-zika-virus
- Frog goo to the rescue: https://australianmuseum.net.au/blogpost/science/frog-goo-to-the-rescue
- Bird Poo Frogs – More species than meets the eye!: http://australianmuseum.net.au/blogpost/amri-news/amri-bird-poo-frogs-more-species

5. Session structure

a) Introduction - Engage

- Ask students what they know about science research in practice. What kind of scientists do they know? What type of research do the scientists do?

b) Suggested activities – Explore, Explain and Elaborate

- **An interview with Dr Jodi Rowley**

  Students view the video and/or listen to the podcasts. They learn about the importance of frogs, the work of an amphibian biologist and the research Jodi Rowley is currently conducting at the Australian Museum. After they have viewed the video and/or listened to the podcasts, the students could:

  - Create a poster showing all the things an Amphibian Biologist does.
  - Pretend they are an Amphibian Biologist and write their diary entry for a day: 'A day in the life of an Amphibian Biologist'.
  - Write about why they would or wouldn't like to be an Amphibian Biologist like Jodi. Which parts of her job would they like and/or dislike?
  - Do a presentation about how Jodi Rowley is contributing to the world's knowledge of frogs and why her work is so important to Australia and the world.
  - Write questions that they would like to ask Jodi Rowley.
  - Have a class debate on the topic 'Scientific Research in Australia should have its funding from the government dramatically increased'.

- **Frog Research Task**

  Students become scientists and complete research, either individually or in groups.

  - They select an Australian frog and find out about its habitat, distribution, adaptations, life cycle and whether it has any threats or issues. They could choose a frog that lives in their own locality.
  - Students can use many different modes of research - books, internet, videos, mobile apps.
  - They could report their findings back to the class and in groups through role play, a digital presentation, a speech or a sculpture.
  - Encourage students to ask questions about each other's presentations.

Frog Adaption and Evolution -Teacher Resource

1. Summary

Students learn about how animals have evolved to suit their environments and have adaptations that make them best suited for their environment.

2. Objectives

- Students identify differences between habitats.
- They link different habitats to the different frog species inhabiting a range of ecosystems
- They learn about the theory of evolution by natural selection.
- They learn that frogs have features that suit their habitat.

3. Curriculum links

- **Stage 1**
  - ACSSU211
- **Stage 2**
  - ACSSU073
- **Stage 3**
  - ACSSU043
  - ACSSU094
- **Stage 4**
  - ACSIS133
  - ACSIS124
- **Stage 5**
  - ACSSU176
  - ACSSU185

4. Resources

- Frog Adaptation and Evolution – Student Activity (page 10)
- Tree Frogs and Ground-Dwelling Frogs fact sheets on Australian Museum website: https://australianmuseum.net.au/frogs-amphibians
- Frog feet and hand adaptations: https://australianmuseum.net.au/blogpost/science/put-your-hands-up-and-best-foot-forward
- Adaptations to hide from predators: https://australianmuseum.net.au/blogpost/amri-news/amri-bird-poo-frogs-more-species
- Evolution of tree frogs: https://australianmuseum.net.au/blogpost/science/frogs-in-the-trees
- 'Flying frogs' adaptations: https://australianmuseum.net.au/blogpost/science/aerodynamic-amphibians]
- Frogs behaviour in their habitat: https://australianmuseum.net.au/blogpost/amri-news/linking-frogs-with-flows
- A frog that build nests: https://vimeo.com/71330538

5. Session structure

a) Introduction – Engage

- Establish prior knowledge of types of habitats frogs may live in.
- Establish prior knowledge of evolution and adaptations.

b) Suggested activities - Explore, Explain and Elaborate

- **Frog Adaption and Evolution – Student Activity (page 10)**
  Students complete research about their selected frog.
    - They consider what adaptations it would need to survive in a different environment.
    - Students could use many different modes of research - books, internet, videos, mobile apps.
    - They could report their findings back to the class and in groups through role play, a digital presentation, a speech or a sculpture.
    - Encourage students to ask questions about each other's presentations.

- **Interview with a frog**
  Students select an adaptation of a particular frog species and research it in depth. They could then write a script of an interview with the frog asking them about the adaptation and how it helps them in their daily life. They could share their interview with the rest of the group by acting it out in pairs, one being the journalist and one being the frog.

- **A day in the life of a frog**
  Students could write a journal entry or draw a storyboard of a day in a frog's life. They should demonstrate the way the frog uses its adaptations (physical and behavioural) to help them in their daily life.

Frog Adaption and Evolution – Student Activity

Select a species of Australian frog and find out about its current environment.

What adaptations does your frog have in order to survive in its current environment?

- Does it have sticky toe pads for climbing?
- Does it hibernate out of the cold?
- Does it lay its eggs in a particular way?

Now think of a new environment that your frog has to live in.

What differences are there between the current and new environments?

- Is it drier?
- Is it hotter?
- Is it wetter?

What adaptations does your frog need to survive in its new environment?

- Does it need to stay out of the sun?
- Does it need to travel to find water?
- Does it need to hold water?

Would you expect your frog to change its size?

- Would it get bigger?
- Smaller?
- Flatter?
- Rounder?
- Why?

Are there any frogs living in similar environments around the world today?

What adaptations do they have?

- Do you think your frog would have the same adaptations?

Draw your new frog with its new adaptations

- Make sure you label the new adaptations!
- What they are for?

Endangered Frogs - Teacher Resource

1. Summary

Students learn about the threats, conservation issues and conservation methods related to endangered frog species.

2. Objectives

- Students understand the threats to frog populations.
- They understand conservation issues.
- Students learn about what is being done and what can be done to conserve frog species on a national and individual scale.

3. Curriculum links:

- **Stage 1**
  - ACSSU211
- **Stage 2**
  - ACSSU073
- **Stage 3**
  - ACSSU043
  - ACSSU094
- **Stage 4**
  - ACSIS124
  - ACSIS133
  - ACSHE135
  - ACSHE223
- **Stage 5**
  - ACSSU176
  - ACSSU185

4. Resources

- Endangered Frog – Student Activity (page 13)
- Endangered Frog – Student Example (page 14)
- Tree Frogs and Ground-Dwelling Frogs fact sheets on Australian Museum website: https://australianmuseum.net.au/frogs-amphibians
- AMplify podcast: frog discovery and extinction: https://australianmuseum.net.au/blogpost/at-the-museum/amplify-episode-3-dr-jodi-rowley
- AMplify podcast: the role of amphibians in the ecosystem and consequences of extinction: https://australianmuseum.net.au/blogpost/at-the-museum/amplify-episode-3-dr-jodi-rowley
- Conservation status: https://australianmuseum.net.au/blogpost/science/amri-conservation-status-matters
- Extinction of frogs before they are discovered: https://australianmuseum.net.au/blogpost/amri-news/amri-gone-before-we-know-they-exist
- How to use FrogID video: https://www.youtube.com/watch?v=sl73oSP1MjE

- The Peppered Tree Frog: https://australianmuseum.net.au/the-search-for-the-peppered-tree-frog
- Species discovery and conservation: https://australianmuseum.net.au/blogpost/amri-news/amri-closing-the-gap
- Critically endangered frogs in Indochina: https://australianmuseum.net.au/blogpost/amri-news/amri-mountain-top-frogs-teetering-on-the-edge
- Habitat destruction: https://australianmuseum.net.au/blogpost/amri-news/amri-five-new-frog-species-discovered
- Parasites and disease: https://australianmuseum.net.au/blogpost/amri-news/the-impact-of-a-disease-on-southeast-asian-frogs-a-first-look, https://australianmuseum.net.au/blogpost/science/amri-frogs-need-to-watch-their-backs

5. Session structure

a) Introduction – Engage

- Establish prior knowledge of the role of amphibians in ecosystems and food webs.
- Establish prior knowledge about potential threats to frog populations.
- Discuss the differences between conservation statuses.

b) Suggested activities – Explore, Explain and Elaborate

- **Endangered Frog Activity (page 13)**
  Students select a frog species and research:
  - General information about the frog.
  - Threats to the species population.
  - Conservation issues and methods of conservation.

  Students consider how they can contribute to conservation efforts for their frog species as well as frogs more generally, and how FrogID may help with this. Once students have completed their research, they are encouraged to present their findings in an imaginative way. They could create a digital presentation, a short film (see below), written report, poster, or use another available medium. See 'Endangered Frog – Student Example' on page 12 for a sample report. They could create a poster encouraging actions to help endangered species or write a poem about the endangered frogs.

Sleek Geeks Science Eureka Prizes

If students choose to make a short film, these can potentially be entered into the Sleek Geeks Eureka Prize competition. The films are required to be 1-3 minutes long and based around a science theme. There is no entry fee to the competition.
For full details including entry conditions, please go to:
https://australianmuseum.net.au/eureka-teacher-resources

Endangered Frog – Student Activity

Choose an endangered species of Australian Frog to research.

Some examples are:

- Baw Baw Frog *Philoria frosti*
- Giant Barred Frog *Mixophyes iteratus*
- Tinker Frog *Taudactylus sp.*
- Beautiful Nursery Frog *Cophixalus concinnus*
- Armoured Mistfrog *Litoria lorica*

Find out:

a. General information about your frog

- What does it look like?
- How big is it?
- What is its life cycle?
- What adaptations does your frog have that help it in its environment?

b. What issues are facing your frog?

- Climate change?
- Invasive species?
- Environmental destruction?

c. How might the population of your frog change over time?

- Is the population likely to go up or down?
- What has happened to the species population in the past?

d. What can we do to help?

- What actions can we all take to ensure this frog does not become extinct?

e. How will FrogID help?

- How could FrogID help endangered species in the future?

f. Ethics questions:

- Should we try and bring back extinct species of frogs?
- If we could bring them back, should we still protect them before they go extinct?

Present your findings in an imaginative way.

Endangered Frog – Student Example

Corroboree Frog
Pseudophryne corroboree

What does it look like?

- Small with short limbs
- Rounded snout
- Yellow and black markings

Size

- 2.5-3 cm long

Habitat

- Kosciusko National Park.
- Corroboree frogs use pools and sphagnum bogs, wet tussock grasslands, fens and wet heath for breeding. Some water bodies dry up outside of breeding season, so frogs will shelter in dense litter and under logs and rocks.

Life cycle

- The female lays up to 38 eggs which are then guarded by the male in a nest.
- The tadpoles stay in the eggs as they grow until the nest is flooded by rain at about 4-6 months.
- Tadpoles continue to grow and develop into frogs at about 8 months of age.
- The young frogs continue to develop and start breeding at 4 years of age.

What adaptations does the Corroboree Frog have that help it in its environment?

- It produces poison to protect it from predators so the Corroboree Frog has no native predators as a result.
- It hibernates in winter to help it survive the cold.
- Males guard the egg nest.

What threats does the Corroboree Frog face?

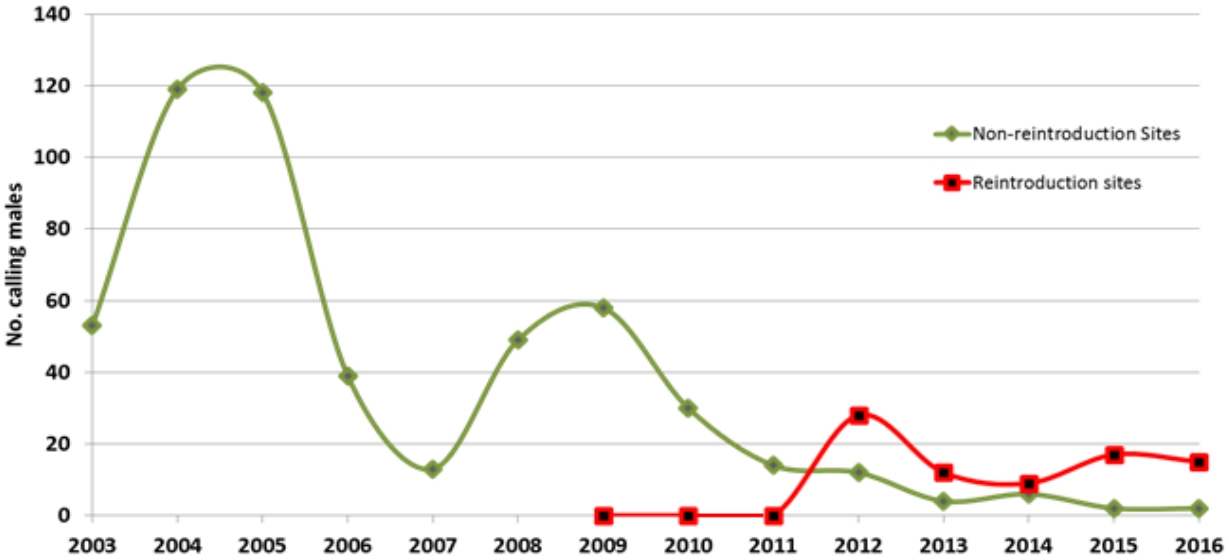
- **Chytrid Fungus:**
  This is a disease which infects the skin of frogs, spreading through water or direct contact with other frogs. The fungus causes an electrolyte imbalance, resulting in cardiac arrest.
- **Invasive plants:**
  Some invasive exotic plant species are impacting breeding grounds by smothering and shading ponds, rendering it unsuitable for frogs.

- **Invasive animals:**
  Corroboree frogs are toxic, so they aren't eaten, but feral animals like pigs and horses cause damage to habitat and breeding sites.
- **Habitat damage:**
  Habitat damage often comes from livestock which trample the pools and bogs that Corroboree Frogs breed in.
- **Climate change:**
  Corroboree Frogs are adapted to cold tundra environments. As the climate changes, these environments may become rarer, meaning there are less habitats for the frogs to live in. They also rely on autumn and winter rains for their eggs to hatch so changes in rainfall patterns may cause issues with breeding patterns.

Photo © Phil Ingamells Bog damaged by cattle grazing
http://www.smh.com.au/national/cattle-wars-20131201-2ykfg.html

How has the population changed over time?

The following graph shows the change in Corroboree Frog populations over time, measured by calling males



Graph: http://www.corroboreefrog.org.au/conservation/population-monitoring/

Photo © Michael McFadden Frog-proof fence https://theconversation.com/australian-endangered-species-southern-corroboree-frog-16189

What is being done?

Breeding programs at zoos such as Taronga Zoo, the Amphibian Research Center at Melbourne Zoo and Healesville Sanctuary all hold captive populations.

The 2008 Horse Management Plan protects the Corroboree Frog's habitat by reducing feral animals.

Livestock is now banned in the Kosciusko National Park.

What we can do to help?

- Raise awareness of the plight of frogs.
- Hold an event at school to raise donations for protecting Corroboree Frogs.
- Reduce our carbon footprints.
- Use FrogID to record frog calls and track populations.

Curriculum Links

Stage 1:

ACSSU211 - Living things live in different places where their needs are met:

- Exploring different habitats in the local environment such as the beach, bush and backyard
- Recognising that different living things live in different places such as land and water
- Exploring what happens when habitats change and some living things can no longer have their needs met
- Recognising that frogs live in lots of different types of environments in Australia
- Recognising that frogs have needs that are met by their environment
- Identify which frog species live in the local area
- Identify what needs local frog species might have and how these could be met

Stage 2:

ACSSU073 - Living things depend on each other and the environment to survive

- Recognising that environmental factors can affect life cycles such as fire and seed germination
- Recognising that frogs depend on their environment
- Recognising that frogs are adapted to their environment
- Designing a pond which can support local frog populations

ACSHE061 - Science involves making predictions and describing patterns and relationships

- exploring ways in which scientists gather evidence for their ideas and develop explanations

Stage 3:

ACSSU043 - Living things have structural features and adaptations that help them to survive in their environment:

- Explaining how particular adaptations help survival such as nocturnal behaviour, silvery coloured leaves of dune plants
- Describing and listing adaptations of living things suited for particular Australian environments
- Exploring general adaptations for particular environments such as adaptations that aid water conservation in deserts
- Describing particular adaptations that help frogs survive in their environments

ACSSU094 - The growth and survival of living things are affected by physical conditions of their environment:

- Investigating how changing the physical conditions for plants impacts on their growth and survival such as salt water, use of fertilizers and soil types
- Observing the growth of fungi such as yeast and bread mould in different conditions
- Researching organisms that live in extreme environments such as Antarctica or a desert
- Considering the effects of physical conditions causing migration and hibernation
- Investigating how changes in their environment can impact frogs
- Recognising that damage to the environment (through climate change, deforestation etc.) can reduce frog populations
- Designing a frog pond which takes the growth and survival of local frog populations into account

ACSHE098 - Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions

- exploring institutions and locations where contemporary Australian scientists conduct research on catastrophic natural events

Stage 4:

ACSIS124 - Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge

- Working collaboratively to identify a problem to investigate
- Recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation
- Using information and knowledge from previous investigations to predict the expected results from an investigation
- Identifying and researching scientific questions relating to frog populations
- Making predictions based on scientific knowledge about the future of frog populations
- Designing a frog pond based on research and scientific knowledge

ACSIS133 - Communicate ideas, findings and evidence-based solutions to problems using scientific language, and representations, using digital technologies as appropriate:

- Presenting the outcomes of research using effective norms of representation or data or ideas and scientific language that is appropriate for the target audience

- Using digital technologies to access information and to communicate and collaborate with others on and off site
- Researching and presenting scientific information about Australian frogs

ACSIS140 - Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed:

- Working collaboratively to decide how to approach an investigation
- Identifying any ethical concerns that may apply to the investigation
- Taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

ACSIS148 - Communicate ideas, findings and evidence -based solutions to problems using scientific language, and representations, using digital technologies as appropriate

- using digital technologies to construct a range of text types to present science ideas
- selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

ACSHE135 - Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations:

- Investigating strategies implemented to maintain part of the local environment, such as bushland, a beach, a lake, a desert or a shoreline

ACSHE223 - Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures

- identifying the contributions of Australian scientists to the study of human impact on environments and to local environmental management projects

Stage 5:

ACSSU176 - Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems:

- Recognising that changes in ecosystems impact on frog populations
- Investigating how changes in the ecosystem, such as climate change, can have wide ranging impacts on species in the system
- Developing a functioning ecosystem through the creation of a frog pond

ACSSU185 - The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence:

- Identifying adaptions of frogs which makes them suited to their environment

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