

Stage 3 Science and Technology Competition

Teacher's Handbook and Learning
Sequence



Introduction

This investigate unit is designed to help students understand cane toads and their threat to the Australian environment and agricultural production. Why some animals are to be protected and others need to be eradicated.

The resource includes:

- Teacher guide (this document) with answer guide (appendix 2)
- Student workbook (print or electronic version)
- PowerPoint presentation to use in delivering the activities (includes links to websites and videos suggested in the learning activities)
- The NSW Department of Primary Industries cane toad flyer
- A Biosecurity Warrior stamp to share with students who complete the unit.

The student workbook is designed to complement this series of learning activities. However, you may choose to have students complete the activities in their note books or in online classroom spaces.

The resource is most suitable for stage 3 and 4 students. It is adaptable to students in most stages and designed to allow teachers to differentiate learning for a range of students. For example; the student workbook allows spaces for completing research, for completing a mapping activity or for demonstrating an understanding of the features of different frogs. You can vary the way these activities are completed according to the level your students are working including completing the activity in groups rather than individually, choose how much time to spend on each activity by varying the detail or ask students to present an oral report.

Each activity can be used as a standalone activity. You can choose to use parts of the resource or the whole unit. If you are looking for a shorter program or have already covered frogs with your class and would like to get straight to the cane toads, start from activity 4.

The electronic version allows students to complete the workbook on a computer and for the use of assistive technologies including screen readers.

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Learning activities

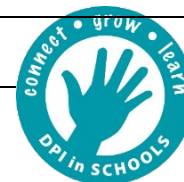
Investigate: cane toads	Duration:	Stage:	Teacher:
These activities will support students in working towards: >Living world - ST3-SCI-01 - uses evidence to explain how scientific knowledge can be used to develop sustainable practices >Geography - HS3-GEO-01 - examines global citizenship and how people organise, protect and sustainably use the environment, using geographical information			
Ways to extend student learning from this unit Develop a Learning Wall during the unit – include vocabulary specific to frogs, cane toads and ecosystems. Post student questions on the wall and regularly discuss the progress towards answering them. Include brief summaries of each lesson to remind students of the learning you have already completed (particularly useful for students who are absent on days that activities are completed).			

Lesson name	Activities	Rationale	Assessment	Resources	Date / Initial
1. What are frogs?	Ask your students to think of three to five words each that describe frogs, where they live, what they look like or feel like and why they exist. Type the words (or have students type them) into a document and then copy and paste them into a word cloud (https://www.wordclouds.com/). This provides a great visual representation of the group's understanding of frogs and how they feel about frogs. Note: Repeating this after completing a few of the following learning activities will give students a visual representation of their changing appreciation of frogs. View the video on ABC Splash "All about frogs" and use the listed websites to research what frogs are and how they are different to other animals. The student workbook provides an option for the structure of the research. PowerPoint: Includes links to the ABC Splash video and the websites suggested for research. More detailed activities and resources for this session are available from the Australian	The questions in the workbook are broad as are the range of frogs around the world. The aim of this exercise is for students to appreciate just how many different species of frogs there are and that different frogs are adapted to different environments. This understanding will help students appreciate why cane toads are such an invasive pest species.	Formative: Check in with students about their understanding about frogs. Ask: What is one new thing you know about frogs? What surprised you about frogs? What would you like to know more about?	Videos: ABC Splash All about frogs https://education.australian.gov.au/home#!/media/2519447/ Websites: NSW Department of Planning, Industry and Environment web site https://www.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/frogs The Australian Museum https://australianmuseum/learn/animals/frogs/ How Stuff Works https://animals.howstuffworks.com/amphibians/frog.htm	

	Museum Frog ID website https://portal.frogid.net.au/schools			Frogs of Australia https://frogs.org.au/frogs/search.php	
2. Lifecycle of a frog	The workbook includes an example life cycle from the internet. Students can either move the stages into the correct order (electronic version) or cut out and glue them into the correct order (print version). The ABC Splash video from the earlier activity also includes information about the life cycle of a frog. PowerPoint: An animated version of the lifecycle that is included in the student workbook. More detailed activities and resources for this session are available from the Australian Museum Frog ID website https://portal.frogid.net.au/schools	Studying the lifecycle of an animal helps students to understand the changing needs of an animal in different parts of their life cycle. It also demonstrates why particular species prefer different environments.	Formative: Ask students what the similarities and differences are between the life cycle of a frog and of humans.	Life cycle image is from: https://englishiscool.site.wordpress.com/2016/11/21/frog-cycle/	
3. A frog for every environment	Assist students to research a range of frogs from a range of environments to complete the workbook research page – individually or in a group. Ensure students understand the importance of checking that they are on an Australian website (or at least talking about Australian frogs) and that it is a reliable source.	To help student understand the difference between native frogs and cane toads – to value native frogs and	Formative: Ask students to share with the class one of the frogs they researched, or an interesting fact if someone else has	Websites: Australian Geographic https://www.australiangeographic.com.au/topics/wildlife/20	

	PowerPoint: The image is the result of a google search for frog images and highlights the range (and beauty!) of frogs around the world. The next slide links to the suggested websites in resources. More detailed activities and resources for this session are available from the Australian Museum Frog ID website https://portal.frogid.net.au/schools	understand that cane toads are not inherently bad, in their natural environment they are fine.	already shared the frogs they researched.	17/10/australian-frogs/ Backyard buddies (a project of the Foundation for National Parks & Wildlife) https://www.backyardbuddies.org.au/explore/frogs The Australian Museum https://australianmuseum/learn/animals/frogs/	
4. What is the difference between frogs and toads?	Discuss with students the ways that frogs and toads are represented in children's stories and nursery rhymes. How does that impact the way we feel about them? Frogs and toads have similarities and differences that are highlighted on the listed websites – check videos on YouTube although Australian versions are very hard to find. https://reptile.guide/frogs-vs-toads/ Note: there are no toads native to Australia.	Frogs and toads are often mistaken – particularly overseas where both occur naturally. There are some physical differences that can help distinguish between frogs	Formative: Student participation in the class discussion to complete the Venn diagram.	(From the activity content) https://australianmuseum/blog-archive/science/frogs-and-toads/ https://reptile.guide/frogs-vs-toads/	

	https://australian.museum/blog-archive/science/frogs-and-toads/ Assist students to complete the Venn diagram in their workbook of the similarities and difference between frogs and toads.	and toads. This will help students with the identifying cane toads activities.			
5. What is a cane toad?	Toads are in the same family as the frog, they are in their own genus and there are many species including the cane toad. The cane toad was introduced to Australia and are a problem because they are poisonous to native animals and pets. They also reproduce in huge numbers and take over habitats of native frogs. View the websites listed and assist students to label the diagram and complete the information about cane toads. The included NSW DPIRD cane toad flyer is also a useful reference. A very cool 3D image of the cane toad is available on the NSW DPIRD website PowerPoint: The first slide in this section is from the NSW DPIRD flyer and describes the features of cane toads. The image will help students label the features of a cane toad.	It is important to understand why cane toads (and other non-native species) can be a huge problem. These activities give students an understanding of the impact cane toads are having in Australia, why they need to be controlled and the importance of knowing the difference between cane toads and some similar native frogs.	Formative: Completion of the labelling activity, and participation in the PowerPoint labelling.	https://www.dpi.nsw.gov.au/dpi/biosecurity/invasive-plants-and-animals/pest-animals/Managing-new-exotic-animal-incursions/Information-on-animals-that-are-illegal-to-keep-or-deal-with/cane-toad/Guidance-on-cane-toad-management-in-NSW https://www.environment.gov.au/biodiversity/invasive-species/feral-animals-australia/cane-toads https://www.wwf.org.au/news/blogs/10-facts-about-cane-toads#gs.d46uwf	



6. Why are cane toads a problem?	The student workbooks include a close activity and comprehension questions of the text on the NSW DPIRD cane toad webpage under behaviour and impacts. The correct answers are included in the appendix. More information about the impacts of cane toads is on the National Geographic website listed in resources. PowerPoint: includes a link to the Cane Toad page on the NSW DPIRD website.		Formative: Completion of the close activity and comprehension questions.	https://www.dpi.nsw.gov.au/dpi/biosecurity https://www.nationalgeographic.com/animals/amphibians/c/cane-toad/	
7. What are we doing about cane toads? How can I help?	View the NSW DPIRD website about the cane toad problem in NSW (or check your state's equivalent site if you are outside NSW). The website advises: 'There is no broadscale method to control the cane toad. However, maintaining awareness of cane toads, reporting their presence and managing them responsibly when detected will help in slowing the spread and further establishment of cane toads in NSW. The Cane Toad Biosecurity Zone incorporates all areas of NSW except a portion of the north east of the state where surveys indicate that cane toads have established endemic populations.'	The NSW DPIRD website is updated as the spread of cane toads is confirmed. Students in the Biosecurity / Buffer zone and the Cane Toad free zone can assist the fight against cane toads by reporting sightings –	Formative: Completion of the mapping activity including locating their town or location on the map.	https://www.dpi.nsw.gov.au/dpi/biosecurity	



	The student workbook includes a map for students to record how far the cane toads have spread into NSW. Assist students to map the location of your town on the map. Which zone are you located in? Discuss with students where they think this information comes from? Lead this discussion in to how they can play a part in the fight to control cane toads in NSW – the workbook includes a place to record what to do if they find a cane toad and where to report sightings.	details on the brochure included in this package.			
8. Learn the difference between some native frogs and cane toads	Assist students to learn the difference between some Australian native frogs that look similar to cane toads and the invasive, non-native cane toad. View the website listed in the resources. The NSW Department of Planning, Industry and Environment website includes the sounds that cane toads and some native frogs make. Link in the PowerPoint. The PowerPoint includes a review of the features of cane toads and some images of native frog mixed amongst images of cane toads. The check list guides student observation. The images are replicated in student workbooks where they can record their decisions.	To be a part of the fight to control cane toads students need to be able to distinguish between cane toads and the native frogs that are often confused with cane toads.	Formative: Successful completion of activity to identify cane toads and native frogs. Summative: You can choose to use the student workbooks as a summative assessment piece. There is also a quiz at the end of the PowerPoint that you can use to assess student understand of the content of this package.	Australian Museum frog facts https://australian.museum/learn/animals/frogs/ and FogID app https://australian.museum/get-involved/citizen-science/frogid/	

	Teachers can choose to run this as a whole class activity or as an individual assessment piece. The teacher package includes a 'stamp' that you can use for students who can tell the difference between cane toads and native frogs – insert it on to electronic workbooks after you have marked them or contact us for stickers to use with printed workbooks. Complete the review questions / quiz either as a class activity or as an assessment task.				
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Activities to extend student learning

Frog surveys

Usually we would suggest you conduct a surveillance program when undertaking an Investigate unit. Frogs and toads are a bit more problematic because they are active in the early hours of the morning and evening – not great for school activities! However, you can encourage students to download the Australian Museum Frog ID app and take part in their fantastic citizen science program monitoring native frog populations and distributions as well as the spread of cane toads. It's a great homework option!

More information about the project and links to download the app can be found at <https://australian.museum/get-involved/citizen-science/frogid/>.

Raising tadpoles

Many people raise tadpoles at home and return the frogs to the waterway where the tadpoles were collected. This is an exciting way to learn about the lifecycle of frogs and may be an appropriate activity for your classroom. Check the requirements for caring for tadpoles and frogs in the links below as well as the advice from the Animals in Schools website to see if it can work in your classroom.

<http://homeschooling.c3park.com/how-to-raise-tadpoles.html>

<http://allaboutfrogs.org/info/tadpoles/>

<https://www.farmanddairy.com/top-stories/how-to-raise-frogs-from-tadpoles/609610.html>

<https://education.nsw.gov.au/teaching-and-learning/animals-in-schools/animals-in-schools-species/australian-native-animals>

Research other invasive species incursions in Australia

Australian governments (state and federal) take Australia's biosecurity very seriously. We are in a fortunate position that we are an island and are able to monitor incoming goods and people that arrive via ports around Australia. It's a huge job though and sometimes something gets by the responsible authorities (???).

Research some recent incursions and the progress on eradicating them:

- [Red Imported Fire Ant](#)
- [Yellow Crazy Ant](#)
- [Asian Black-spined Toad](#)
- [Red Eared Slider Turtle](#)

There are also animals in Australia that have been here for so long and are so widespread that management focuses on control rather than eradication until eradication is a possibility. More information about invasive species in NSW is available on the NSW DPIRD website (<https://www.dpi.nsw.gov.au/dpi/biosecurity/invasive-plants-and-animals/pest-animals>)

Check out the [FeralScan](#) website and app to see the distribution of some of these invasive species and how students can take part in controlling their spread.

Make a frog pond

Information about how to build a frog pond in your backyard or school grounds is available on the Australian Museum Frog ID website <https://portal.frogid.net.au/schools>.

Just for fun: Origami frogs

Origami can be challenging for young children (and for teachers to instruct!) but also a great way for students to be able to take home their own frog at the completion of the activities. Some suggested websites for instructions are below:

Video <https://education.abc.net.au/home#!/media/2977481/how-to-make-an-origami-frog>

Instructions (includes some examples of detailed origami to blow your students minds): <https://origami.me/jumping-frog/>

Video and instructions <https://www.nhm.ac.uk/discover/how-to-make-an-origami-frog.html>

More resources from the NSW DPIRD Schools Program

More resources for both primary and high schools are available at <https://www.dpi.nsw.gov.au/education-and-training/school-resources>

Let us know if you enjoyed this resource, or if you have suggestions about this resource or other areas you would like us to cover.

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(<https://creativecommons.org/licenses/by-nc/4.0/>)

Appendix: Image sources in the PowerPoint.

	https://flic.kr/p/mPtb3c https://www.flickr.com/photos/sjonarmerki/
	https://commons.wikimedia.org/wiki/File:Flickr - ggallice - Treefrog tadpoles.jpg
	https://www.scienceimage.csiro.au/image/1842/cane-toad-spawn/
	https://englishischoolsite.wordpress.com/2016/11/21/frog-cycle/
	http://www.ahailey.force9.co.uk/physalaemus.htm
	https://commons.wikimedia.org/wiki/File:Eastern_Banjo_Frog_%28Limnodynastes_dumerili%29_%288744522820%29.jpg
	https://australian.museum/learn/animals/frogs/giant-burrowing-frog/
	https://australian.museum/learn/animals/frogs/perons-tree-frog/
	https://reptilepark.com.au/animals/amphibians/cane-toad/
	https://theconversation.com/weve-cracked-the-cane-toad-genome-and-that-could-help-put-the-brakes-on-its-invasion-103362
	https://australian.museum/learn/animals/frogs/tussock-frog/
	https://commons.wikimedia.org/wiki/File:Juvenile_cane_toad,_Barro_Colorado_Island.jpg
	https://en.wikipedia.org/wiki/Newcastle,_New_South_Wales

Appendix 2 - Student workbook sample answers

What are frogs?

List at least three words that describe frogs and their place in the environment.

Answers vary

What are the five most common words on your class WordCloud?

Answers vary

Complete the form based on the research you have completed.

What are frogs?

Frogs are amphibians, a class of animal that live their lives both in and out of water.

Where do they live?

Mostly around freshwater but different species are adapted to different environments including rainforest, mountains and desert.

What do they eat?

Mostly insects, including crickets, mosquitos, moths, and grasshoppers, they also eat grubs and worms. Some larger species eat small animals.

What do they need to survive?

Most frogs need water to reproduce though it can be a small puddle. They need food and because they have thin porous skin, they need a clean environment.

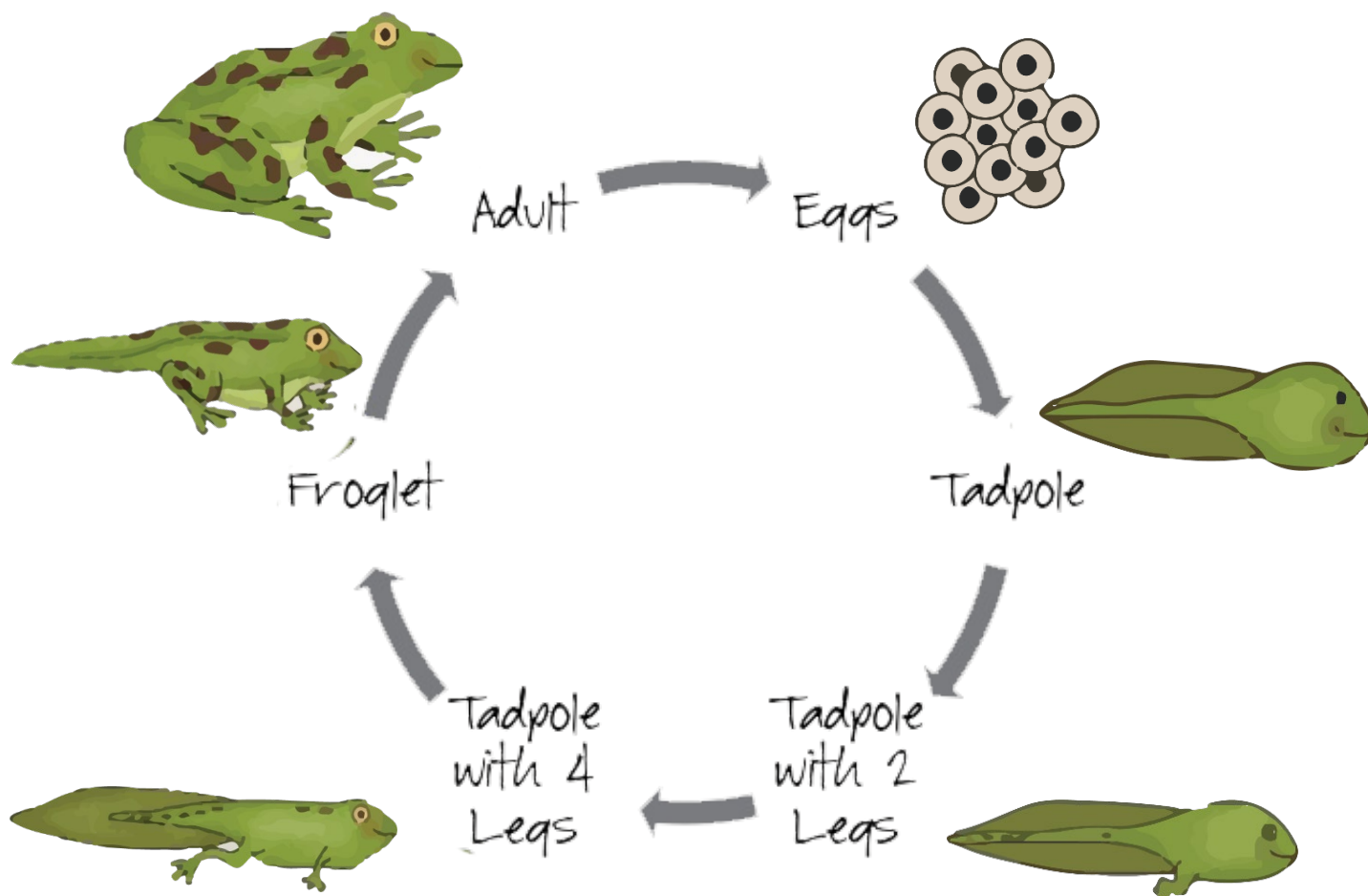
How do they reproduce?

Frogs lay eggs in water which hatch into tadpoles. As the tadpoles grow they lose their fins, grow legs and are able to leave the water.

Lifecycle of a frog

Place the stages of a frog's lifecycle in the correct order on the diagram.

You could also add some information about each stage.



A frog for every environment

Research three different frogs found in Australia. Try to find some that live in very different landscapes including the rainforest, coastal environments or alpine areas. Record the following details:

Answers vary eg from

<https://australian.museum/learn/animals/frogs/eastern-dwarf-tree-frog/>

Common name:

Eastern Sedgefrog

Scientific name:

Litoria fallax

Where are they found?

Australia's east coast, from New South Wales to Cape York Queensland

What sort of environment do they prefer?

Wetlands

How are they adapted for that environment?

The Eastern Sedgefrog is usually a green colour but it can change colour to be brown or a mix of the two. Changing colour gives it camouflage in the vegetation of swamps or dams where it hunts.

What is the difference between a frog and a toad?

Can you think of some children's stories or books with frogs and toads in them? What was the character of the frog or toad like? Do you think it changed the way you think about frogs and toads?

Answers vary

Frogs

- skin has a smooth look, but can also have bumps
- lays eggs in large, round clusters on top of the water's surface
- usually longer and leaner, enabling them to move quickly both in and out of the water

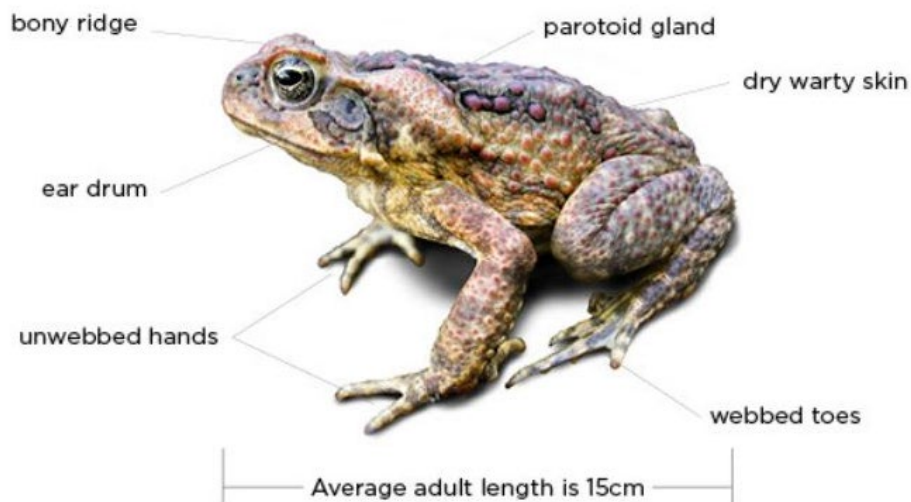
- similar feeding habits
- both have glands that give off secretions
- both shed their skin periodically
- fall under the same taxonomical classification to order (Anura)

- skin is drier, wartier, and more waterproof
- lays its eggs in long strings or lines
- stout bodies that are used more for crawling

Toads

What is a cane toad?

Label the parts of the cane toad below.



Source: Office of Environment and Heritage

Complete the following details (answers are from the Australian Museum website):

Common names:

Cane Toad, Giant Toad; Marine Toad

Scientific name:

Rhinella marina

Where are they found?

In Australia they occur throughout the eastern and northern half of Queensland and surrounding Kakadu National Park in the Northern Territory. They occur on the coast as far south as Yamba in NSW, and there is an isolated colony near Port Macquarie

Where do cane toads come from?

Cane Toads extends occur naturally from the southern United States to tropical South America.

What sort of environment do they prefer?

Habitats ranging from sand dunes and coastal heath to the margins of rainforest and mangroves

How are they adapted for that environment?

They can survive the loss of up to 50% of their body water, and can survive temperatures ranging from 5°C – 40°C

What features allow them to survive in their preferred environment?

It is a prolific breeder, requiring only a small pool of water of almost any nature. Cane Toads eat almost anything they can swallow, including pet food, carrion and household scraps, but most of their food is living insects. Marine snails, smaller toads and native frogs, small snakes, and small mammals are occasionally eaten by Cane Toads.

Why are cane toads a problem?

Complete the following information about cane toads.

Cane toads eat *almost anything* they can swallow, including pet food, carrion and household scraps, but most of their food is living *insects*. The tadpoles of cane toads eat *algae* and other aquatic plants which they rasp off with five rows of tiny peg-like teeth.

They also *filter* organic matter from the water.

Adult cane toads are active at *night* during the *warm* months of the year. They can survive the loss of up to 50% of their body water, and can survive *temperatures* ranging from 5°C - 40°C.

Cane toads are prolific breeders, requiring only a small pool of still or slow-flowing water, and they can tolerate salinity levels up to 15%. The *males* congregate after dark around shallow *water* and mount females as they arrive at the water's edge. As the female releases her eggs, they are fertilised *externally* by the male's sperm.

Females lay 8,000 to *35,000* eggs at a time and may produce two clutches a year although only a small proportion of young survive to adulthood. The eggs hatch within 24-72 hours and the tadpole stage may last from 3-20 weeks. The tadpoles gradually change (metamorphose) into *toadlets* 1-1.5 cm in length that leave the water and congregate in large numbers.

The cane toad is tough and adaptable as well as being poisonous throughout its life cycle. It has few *predators* in Australia, which is bad news for competing native amphibians, and it may be responsible for the population *decline* of the few snakes and other species that do prey on it.

Comprehension questions

Which features of the cane toad make it well suited to being an invasive species?

Cane Toads can breed in most still or slow-flowing water, and tolerate salinity levels up to 15%. Females lay 8,000 to 35,000 eggs at a time and may produce two clutches a year. Toads in the tropics grow very quickly and may reach sexual maturity within one year

How does the behaviour of the cane toad make it a threat to Australian wildlife?

Cane toads:

- *poison pets and injure humans with their toxins*
- *poison many native animals whose diet includes frogs, tadpoles and frogs' eggs*
- *eat large numbers of honey bees, creating a management problem for bee-keepers*
- *prey on native fauna*
- *compete for food with vertebrate insectivores such as small skinks*
- *may carry diseases that are can be transmitted to native frogs and fishes.*

Which features of the cane toad might help to limit its spread throughout Australia? Think about the different environments and weather in different parts of Australia.

Cannot survive in very cold or vert dry environments so will be limited in establishing in those areas. They can however be transported across if people are not vigilant.

Does the description of the life cycle match the frog life cycle you completed earlier in the book?

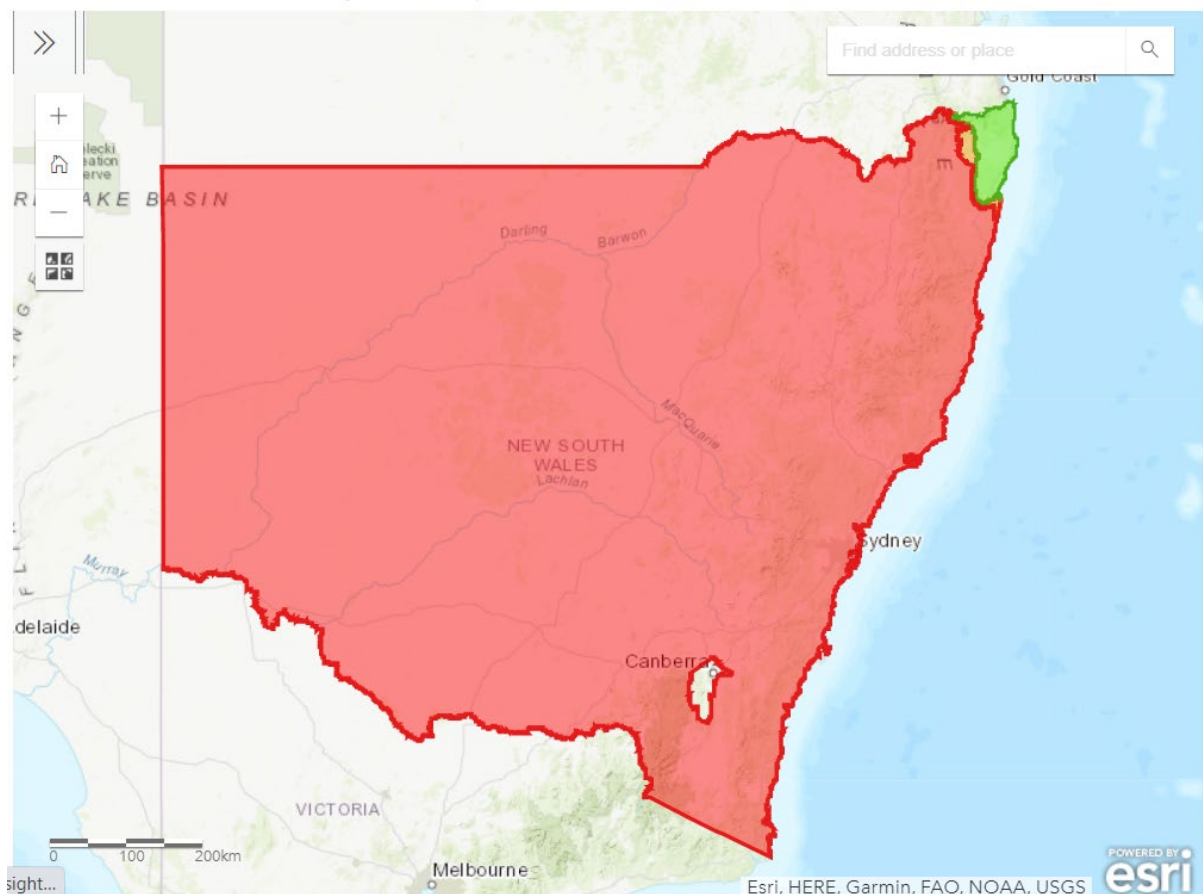
✓ Yes ☐ No

How might the cane toad impact agriculture in Australia?

Strong primary industries and agricultural production rely on healthy environments. The impact that cane toads can have on natural areas and food webs weaken natural ecosystems and make food and fibre production less sustainable.

What are we doing about cane toads?

Map the area of NSW where cane toads are currently found.



Mark and label where you live.

Which zone are you located in? Are there currently cane toads in that area?

Answers vary

What can you do about cane toads?

What should you do if you have seen a cane toad in either the Buffer Zone (amber on the map) or the Cane Toad free zone (red on the map).

Catch it:

Making sure to:

- 1. Not to harm it – it might actually be a native frog*
- 2. Wear protective clothing such as disposable gloves, glasses, long sleeves and eye protection before touching it*
- 3. Watch out for poison. When stressed, cane toads can ooze and sometimes squirt poison from glands behind the head*
- 4. If you can do so safely, keep it in a well-ventilated container with a little water in a cool location while we determine the species*

Report it:

Making sure to:

- 1. Take a photo (if you can)*
- 2. Record your location*
- 3. Report the detection*

What is the website address for reporting cane toads?

www.dpi.nsw.gov.au/biosecurity/sighting

Native frog or cane toad?

Can you tell the difference between a cane toad and these native frogs?



- ☒ dry warty skin?
- ☒ bony ridges over its eyes?
- ☒ parotoid glands (large swellings) on each shoulder behind the eardrum
- ☐ bright colours?

Is it a cane toad?

☒ Yes

This is a *Cane toad*



- ☐ dry warty skin?
- ☐ bony ridges over its eyes?
- ☐ parotoid glands (large swellings) on each shoulder behind the eardrum
- ☒ bright colours?

Is it a cane toad?

☒ No

This is a *native Eastern Pobblebonk Frog*



- ☐ dry warty skin?
- ☐ bony ridges over its eyes?
- ☐ parotoid glands (large swellings) on each shoulder behind the eardrum
- ☒ bright colours?

Is it a cane toad?

Yes

☒ No

This is a *native Giant Burrowing Frog*



- ☐ dry warty skin?
- ☐ bony ridges over its eyes?
- ☐ parotoid glands (large swellings) on each shoulder behind the eardrum
- ☒ bright colours?

Is it a cane toad?

Yes

☒ No

This is a *native Peron's Tree Frog*



- ☒ dry warty skin?
- ☒ bony ridges over its eyes?
- ☒ parotoid glands (large swellings) on each shoulder behind the eardrum

☐ bright colours?

Is it a cane toad?

☒ Yes

This is a *Cane toad*



- ☐ dry warty skin?
- ☐ bony ridges over its eyes?
- ☐ parotoid glands (large swellings) on each shoulder behind the eardrum
- ☐ bright colours?

Is it a cane toad?

Yes

☒ No

This is a *native Tusked Frog*



- ☒ dry warty skin?
- ☒ bony ridges over its eyes?
- ☒ parotoid glands (large swellings) on each shoulder behind the eardrum

☐ bright colours?

Is it a cane toad?

☒ Yes

This is a *Cane toad*

Review questions:

Are all frogs invasive pests? Why, or why not?

No, Australia has over 200 species of native frogs that are not invasive because they are occurring in their natural environment.

What should you do if you think you have seen a cane toad?

Take a photo or capture it if you can do so without risk to you or the frog. Record the location and date and report it to www.dpi.nsw.gov.au/biosecurity/sighting

What are the four features you can use to tell a cane toad from an Australian native frog?

- *dry warty skin*
- *bony ridges over its eyes*
- *parotoid glands (large swellings) on each shoulder behind the eardrum*
- *bright colours*

Why are cane toads a problem in Australia?

They are not native and are outcompeting native species in their natural environments. They are also poisonous to many native species who are not adapted to consuming them. They reproduce very fast and can survive in a range of environments so can spread very fast. The damage that cane toads can do to the Australian environment can impact the health of a range of environments as well as agricultural production.