



Cane Toad

CONTROL HANDBOOK

A Guide to Cane Toads
and How To Control Them



Cover photo: Male cane toad calling - C. Kelehear.
This page: Adult cane toad - J. Rowley.

CANE TOAD CONTROL HANDBOOK

This guide provides the information you need to get you out making a valuable contribution to our community's cane toad control effort.

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CANE TOADS IN OUR REGION

Cane toads were introduced into Australia in 1935 with the aim of controlling the grey backed beetle, which was affecting the sugar cane industry of north Queensland. Cane toad numbers in Australia are now estimated to be over 200 million.

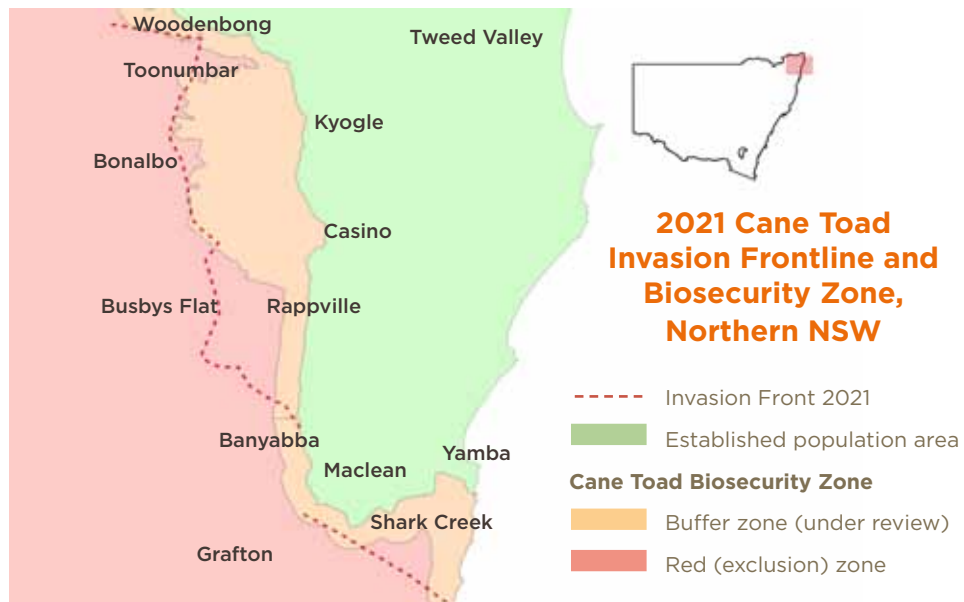
Cane toads (*Rhinella marina*) originate from tropical and semi-arid America. They were imported to Australia from Hawaii, where they were also introduced to control cane beetles. The 102 imported animals rapidly reproduced. Two months later 2,400 toads were released at Gordonvale near Cairns, despite there being a lack of research into their potential impact or capacity to manage the cane beetles.

Although many people believe cane toads to be a Queensland problem, they have now spread from QLD, across the Northern Territory into Western Australia and into northeast New South

Wales. Cane toads were introduced directly to Byron Bay in the 1960s and have been present in the Tweed and Lismore areas since the 1980s. An isolated population has existed in the Yamba-Angourie area since the 1990s.

Cane toads are now established in NSW between Tweed Heads and Sandon River on the northeast coast and inland to parts of the Kyogle, Richmond Valley and Clarence Valley local government areas.

A NSW Cane Toad Biosecurity Zone was gazetted in 2019 to help slow the spread and further colonisation of



cane toads and to eradicate satellite populations elsewhere in NSW. In many parts of Kyogle, Richmond Valley and Clarence Valley landholders have a biosecurity duty to report cane toad sightings and help control cane toads. Further information is on page 32 of this guide.

Photo: L. Jacobs



The western frontline – Kyogle and Richmond Valley

The towns of Casino and Kyogle are situated on the edge of the biosecurity zone. However, cane toads have now spread approximately 20km west of these towns into the Richmond Range. This represents the western invasion frontline in NSW. On the invasion frontline, landholders west of Kyogle and Casino play an important role in preventing further colonisation.

Border Ranges – Richmond Valley Landcare Network (BRRVLN) has been educating landholders at the western invasion frontline to identify and control cane toads on their property. An isolated population of cane toads was found in Bonalbo in 2021, and work is being undertaken to eradicate this satellite population.

The southern frontline – Clarence Valley

The Clarence Valley is the southern frontline of the cane toad invasion in NSW. A population of cane toads has been established in the Yamba – Angourie area for about 30 years. The first of these toads are believed to have

been transported from Queensland in building materials. From that initial establishment, further populations took up residence on Warregah Island, Micalo Island and Palmers Island, in Townsend, and Mororo, and further south at Brooms Head.

Through the hard work and dedication of the Clarence Valley Conservation in Action Landcare group (CVCIA), these breeding populations were being contained. However, cane toads have now also established in Maclean, Gulmarrad, Taloumbi, Woodford Island and Ashby. Aided by the fire events of 2019-20, the wet seasons that followed, and potentially assisted by human activities, cane toads are now reported at Shark Creek, Lawrence and Mountain View. Clarence Landcare continues to work at the southern frontline, delivering community education and cane toad control programs.

OUR WAR ON CANE TOADS

In northeastern New South Wales regional Landcare networks, Landcare groups, landholders, government departments and researchers are working hard to reduce the impact and spread of cane toads.

Cane toads pose a serious threat to a number of species of native animals and can also affect domestic pets, and possibly impact agricultural activities such as beekeeping. Although complete eradication may not be possible, local efforts to control cane toads are proven to reduce local numbers, which helps slow their spread and create toad-free havens.



The Landcare legacy

In recent years, Clarence Landcare and Border Ranges - Richmond Valley Landcare Network have coordinated cane toad control efforts, liaised with biosecurity agencies and disseminated best practice control advice to the public. Funding from North Coast Local Land Services (NCLLS) and National Parks and Wildlife Service (NPWS) has enabled us to deploy field teams to monitor and control cane toads seasonally. Field officers undertake night-time hand collection and manage a trapping program aimed at adult cane toads and tadpoles. Landcare also work with the Department of Primary Industries (DPI) to respond to reports of cane toads in areas where toads have not previously been detected. This early intervention can greatly reduce the spread and even eliminate a small outbreak. However, our ability to carry out cane toad control work into the future is not guaranteed and depends on the continuation of funding each year. It is for this reason that community education is a critical component of our work.

Photo: C. van Dorp/Simon Hughes Photography



Photo: C. Kelehear.

The future of cane toad control is up to you

The public is critical in the fight against cane toads, both at the invasion frontline and in areas with long-established populations. Reducing cane toad numbers depends on people controlling cane toads on their property and reporting sightings to biosecurity agencies (please see page 32 for more information). By doing your bit to control cane toads on your property and in public spaces, you are helping to create safe havens for wildlife and reduce the spread of this invasive pest. You do not have to do this alone -

research has shown community toad-busting to be an extremely effective tool in the fight against cane toads. It is also a fun, social activity!

Researchers are working in NSW to understand how cane toads are dispersing in this environment and to determine the most effective methods to control them. Tadpole trapping technologies are proving very effective for disrupting the breeding cycle. Detection dogs have been trialled to see how they can help locate cane toad outbreaks and eDNA, a method that tests for the presence of toads in water bodies, is another technique planned for future use in cane toad detection.

WHY ARE THEY A CONCERN?

Cane toads pose a serious threat to some native species, pets and agriculture. They are listed as a key threatening process under the federal Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the NSW Biodiversity Conservation Act 2016.



Prolific Breeders

Cane toads can reach maturity in as little as 6 months if conditions are favourable.

Female cane toads can produce 8,000 to 35,000 eggs, sometimes twice a year!

In the wild they can live for at least 5 years.

$2 \times 35,000 \times 5$
 $= 350,000$ EGGS !

Of these about 700 will survive to breed.

Photo: C. Kelehear.

Cane toads are poisonous at all stages of their life cycle — from egg to adult. They are also voracious predators, eating a wide variety of prey, including bees and dung beetles, competing with native frogs and other wildlife for food resources. The fact that they reach high densities in suitable habitat acts to compound these pressures.

Our wildlife is not safe. Cane Toads have toxin-secreting glands (known as parotoid glands) on each shoulder. These glands secrete a white, milky poison when cane toads are threatened. If ingested, this poison can cause rapid heartbeat, excessive salivation, convulsion and paralysis, and can result in death.

Cane toads can severely disrupt ecological communities by killing native predators. Species that prey on native frogs, frog eggs or tadpoles, are most at risk from poisoning. These include freshwater turtles and eels, goannas, frog eating snakes such as red-bellied black snakes, and carnivorous mammals such as quolls and dunnarts.

Few predators in Australia can safely eat cane toads. Most cannot distinguish between cane toads and the native frogs they would normally prey on. Interestingly, some native species, such as keelback snakes, safely eat cane

toads. Others, including the native water rat, have adapted and eat cane toads by avoiding the poisonous parts.

Photo: C. Ison

Cane toads threaten our local biodiversity.

On the north coast of NSW cane toads can impact some of our threatened species including the spotted-tailed quoll, and threatened beetle and reptile populations. Cane toads may also compete with native species for shelter sites and have been observed to eat the young of ground nesting or denning animals. Native frogs are sometimes killed when they are mistaken by the public for cane toads.

Our **pets are at risk of poisoning** when they encounter cane toads if the toxin gets into any mucus membranes - such



as in their eyes, nose or mouth. Without emergency veterinary care, dogs or cats that mouth or bite cane toads may die.

Cane toads are also considered **agricultural pests** as they can consume large numbers of beneficial insects like dung beetles and possibly constitute an economic threat to beekeepers.

Some laughing kookaburras (top) survive a cane toad meal, others don't.



Photo: D. Peterson



Photo: N. Gambold

A python (above) and freshwater turtle (left) were found dead after feeding on cane toads.

HABITAT AND BEHAVIOUR

Cane toads are large ground-dwelling amphibians that breed opportunistically, have very large broods, and can occur in high densities. They breed in still or slow-flowing water, sometimes twice a year. Cane toads can develop rapidly in warm weather, taking between 6-18 months to reach sexual maturity, and can live for more than five years.

Successful survivors

Cane toads are robust, tough and adaptable. This has allowed them to inhabit a range of habitats and survive extreme environmental conditions. They hunker down when it is too dry, too hot or too cold, emerging to take advantage of ideal breeding conditions after spring and summer rain.

Seasonal behaviour

In northern NSW, cane toads are active at night during the warmer months, when they come out of their shelter sites to hunt for food, access water and find mates.

In tropical northern Australia, cane toads can breed all year. However, in our region, breeding is usually restricted to the warmer weather from about October through to May. During this time male cane toads call to attract females to water for breeding. The call is a distinctive guttural trill, sustained for around 30 seconds. They mostly call on hot, humid nights after rain.



Scan this QR code to listen to a male cane toad's call.

Habitat

Cane toads need water to hydrate and reproduce. They will inhabit just about any areas where they have access to water and a food supply.

Cane toads are commonly active at night in the following areas:

- Around buildings where sprinklers, leaking taps and air conditioners can provide moisture.
- Areas lit at night, such as under security lights or floodlights – cane toads are often found near dwellings



or public buildings because they feed on the insects attracted to lights.

- Water bodies of all sizes, especially those with gently sloping banks and not much vegetation around the edges, such as farm dams – toads need access to water every few days to remain hydrated.
- Open corridors that make movement and dispersal easier – cane toads prefer to use roads, footpaths, bicycle paths, wallaby or cattle tracks, fire trails and fence boundaries.
- Any open or disturbed habitats – such as riverbanks, cleared land, woodland, parks, sports fields, paddocks and golf courses.
- Grazing properties – cane toads can be located on dung piles where they feed at night on dung beetles.



Photo: J. Rowley

Shelter sites

Cane toads often shelter in crevices, between rocks, cracks in clay, in hollows under large trees or logs on the ground, in leaf litter or dense vegetation. They will also use artificial shelters such as drainpipes, garden features or mulch, building materials or anything else stored or stockpiled.

Breeding sites

Cane toads will breed in any accessible water body – permanent or temporary – but prefer shallow pools with open (not vegetated), gradually sloping muddy banks. They tend to avoid breeding in flowing water and pools or dams with steep edges. In wet weather, they may take advantage of shallow puddles and even wheel ruts. Cane toads don't usually breed in elevated cattle troughs or raised birdbaths as they are not good climbers.

IDENTIFICATION

Correct identification of cane toads is extremely important as they can look similar to some native frogs at different stages of their development.



What are toads?

'Toad' is a common name for frogs that have dry, bumpy, leathery skin and short legs. Australia has no native 'true' toads, although some of our native frogs are called 'toads' or 'toadlets', which can be confusing.

Like frogs, toads start life as tadpoles, living in water breathing with gills, then transform (metamorphose) into adults that live on land and breathe with lungs.

Key features to look for:



Photo: J. Rowley

- 1 Distinct bony ridges above the eyes, with ridge over the nose forming a distinct 'M' shape.
- 2 Horizontal pupil.
- 3 Large parotoid (poison) glands on adults behind 4 the visible ear drums.
- 5 Warty skin.
- 6 Unwebbed, inward facing front feet; no enlarged pads on toes.



Photo: J. Rowley



- 7 Semi-webbed toes on back limbs.
- 8 Mottled belly usually present.



Photos: Simon Hughes Photography



Photos: J. Rowley

With no enlarged toe pads, cane toads are unable to climb verticle surfaces like native tree frogs

To positively identify adult cane toads all features illustrated must be present.

These features are not specific to cane toads. Some are shared by a few of our native frogs but... no native frog will have them all.

Some common native frogs that can be mistaken for toads can be found on pages 18-19.

The image above is an adult male cane toad (*Rhinella marina*). Note the lack of dark patterning on its back, which helps to distinguish from the female.

IDENTIFICATION

Eggs

Unlike native frog species that typically lay eggs in foam or floating rafts, cane toad eggs are small, black and laid in long clear gel strings. These gel strings usually sink and can be hard to detect. They may be found in any still, shallow water, dams or ponds, typically wrapped around vegetation.

1

Metamorphosis - from eggs to toadlets

- 1 Gel strands of eggs
- 2 Cane toad tadpoles
- 3 Hind legs developed
- 4 Front legs developed, tail resorbing - getting ready to leave the water
- 5 Ready for the move to land, tail stump still present
- 6 At the water's edge, clinging to vegetation
- 7 Able to move away from the water



Tadpoles

Cane toad tadpoles often aggregate at the shallow edges of water bodies and swim in larger schools than native tadpoles.

They can be confused with the tadpoles of native frog species, so confirm your identification by carefully looking for all of the following features:

- Dark, black body colour - most native tadpoles are brown or grey.
- Underbelly (ventral surface) that is black around the abdomen - in native species the underbelly is clear, silvery white or densely speckled.
- Small size - body length is about 11 mm (length including the tail is 22-30 mm when the back legs appear) - native tadpoles are usually bigger.
- A short thin tail - 1 to 1.5 times the length of the body - in native species the tail is usually 2 to 3.5 times the

length of their body. The fins along the tail are clear, while the muscle in the tail is black. Many native species have more colour or veins in the fins.

- The body is broad across the gill region, just behind the eyes.
- The eyes are positioned towards the top of the head rather than the sides.
- Visible nostrils.

Metamorphs

When young toads leave the water they are called metamorphs. Their colour can vary, but generally look black, changing to grey after reaching about 10 mm, when their skin pattern is visible. These tiny toads can be seen during the day swarming from breeding sites. Metamorph cane toads look similar to several small native frog species. Check your ID.



Photos: 1 - Simon Hughes Photography; 3, 4, 5 & 7 - Vicki James; 6 - S. Kaiser

Scan this QR code to watch a video of swarming metamorphs. (Video: S. Kaiser).



IDENTIFICATION

Juveniles

Although the poison glands are not always discernible in juveniles, they look like tiny cane toads in every other respect, with very strong skin patterning. This is when it can be most difficult to determine a cane toad from a native frog. Remember to look for all the features listed on pages 12-13. If in doubt, collect and safely contain it until the identification can be confirmed. You can ask a more experienced toad collector or check the links to cane toad ID resources at the back of this handbook.



Juvenile



This juvenile toad is approximately 1 month old about 4 cm long. Note the pale line down the back, dark striping on the legs and mottled underside.



Subadult

The life stage between juveniles and breeding adults, having not yet reached sexual maturity, can range from about 4 cm up to around 10 cm. They have not developed the characteristic skin colouration of breeding adults (see subadult above).

Adults

Mature adults are about 10 cm and can reach up to 23 cm in body length. Their colour is not distinctive – it can be dark brown to grey or yellow. Females have dark patterned skin, while males' skin tends to be plainer and wartier.

Photos: This page and top opposite - Simon Hughes Photography

ADULT CANE TOADS

should not be identified based on their size. There are a number of large native frog species that can be easily mistaken for cane toads. Check your ID. See native frogs on pages 18-19.



Adult Female

Adult Male



Adult female cane toads retain the dark skin patterns as seen in juveniles.

Adult male cane toads do not retain dark skin patterning like females, are a more uniform colour and often quite yellow.

Photo: J. Rowley

MISTAKEN IDENTITY

Some of our native frogs can be easily mistaken for cane toads. They have some features in common and it can be difficult to recognise who is who.

It is a good idea to find out more about the native frogs in your area and how to tell the difference between them and cane toads. Some native frog species resemble cane toads at different life stages.

The native frog species pictured here occur in our area and are sometimes mistaken for cane toads.

The Australian Museum's FrogID website is a great place to learn about native frogs. The FrogID app has recordings of their calls and also includes great examples of the distinctive cane toad call.



Download the FrogID app by scanning this QR code.



Photo: J. Rowley

Common eastern froglet *Crinia signifera* — extremely variable in appearance; small, up to 3 cm in length.



Photo: U. Skjonnemand



Ornate burrowing frog *Platyplectrum ornatum* — a medium-sized frog reaching up to 4.5 cm; juvenile (left) is very similar to a young cane toad.

Photo: M. Newman



Photo: J. Rowley

The bleating tree frog *Litoria dentata* — a medium-sized species reaching up to 4.5 cm in body length.



Photo: K. Griffiths

Tusked frog *Adelotus brevis* — a medium-sized species up to 5 cm in length; mottled belly similar to cane toad.



Photo: J. Rowley

Great barred frog *Mixophyes fasciolatus* — a large species of frog reaching up to 10 cm in length.



Photo: J. Rowley

Spotted marsh frog *Limnodynastes tasmaniensis* — a medium-sized species reaching almost 5 cm in length.



Photo: J. Rowley

Peron's tree frog (*Litoria peronii*) — a large species reaching up to 7 cm in length.



Photo: J. Rowley

Striped marsh frog *Limnodynastes peronii* — a large species reaching up to 7.5 cm in body length.



Photo: J. Rowley

Scarlet-sided pobblebonk *Limnodynastes terraereginae*, sometimes called the northern banjo frog — a large species reaching up to nearly 8 cm in length.

COLLECTION METHODS

Cane toad control activities can occur year-round. Collection methods should be considerate of the life-stage you are targeting and the seasonal habits of cane toads.



Eggs, tadpoles and metamorphs

Targeting cane toads at the breeding stages is a strategic control method and can result in catching very large numbers with relatively little effort. Search for eggs, tadpoles and metamorphs during the day in the warmer months. Start checking water bodies for any activity as soon as the weather starts to warm up and humidity increases. Cane toads are habitual. If you know toads have bred in a water body, return to it regularly during the breeding season to check for eggs, tadpoles and metamorphs.

Eggs

The gel strings of cane toad spawn sink. However, they can often be found tangled around sticks or water plants. During periods of high rainfall, cane toads will lay eggs anywhere that freshwater pools (flooded paddocks, wheel ruts etc).

Eggs usually hatch within 24 to 72 hours after being laid, so be on the lookout if you have heard toads calling or after spring and summer rain events.

A dip net is an effective tool for removing eggs, but any method will do (a stick, scoop, hands). The strings should be carefully and slowly dragged from the water so they don't break up, then left on the ground to dry out. Remember, the eggs are also toxic so wear gloves. Just think, removing 30,000 eggs from a dam will have a significant impact on potential toad numbers.

Net photo: C. van Dorp/Simon Hughes Photography



Photo: C. van Dorp/Simon Hughes Photography

Stay Safe!

Always wear gloves and protective eyewear when handling cane toads.

Collect with a family member or friend and always tell someone where you plan to go.

The following are some hazards and risks you should consider during cane toad collection.

- Poor visibility at night-time, which could lead to tripping on uneven surfaces or vegetation, colliding with branches, etc.
- Disorientation in the dark.
- Working near water bodies — slipping, drowning, sharp objects in water, etc.
- Insect, snake and spider bites.
- Traffic hazards, when collecting near roads — always wear high visibility reflective clothing or vests.

Recommended equipment

- Spotlight or head torch
- Bait, scoop or dip net (fine mesh for eggs and tadpoles)
- Buckets or containers with lids, or hessian bag that can be tied securely (must be kept damp)
- Long BBQ tongs or rubbish grabber
- Strong waterproof gloves
- Long sleeved shirt and long pants
- Smart phone with GPS
- FrogID and ToadScan apps



Photo: K. McRae



Photo: A. Cook

A slit in the bucket lid reduces the need to remove it and the risk of toads escaping.

COLLECTION METHODS

Tadpoles

Tadpoles are most active during the day and can be collected with a dip-net. Take care not to collect tadpoles of other frog species.

Tadpole traps

Provided a few simple rules are followed, funnel traps can be a highly effective method for catching cane toad tadpoles when used with lures. The University of Queensland has developed cane toad-specific lures, which are made from adult cane toad pheromones. The lures are non-toxic and completely safe to use in waterways. The scent of the pheromone is highly attractive to cane toad tadpoles but is of no interest to native frog tadpoles.

The pheromone scent trail disperses into the water body through the eye of the funnel. Tadpoles follow the density of the scent in through the funnel into the trap and remain inside. It is possible to catch thousands of tadpoles in each trapping session.

Cane toad tadpole lures can be purchased from Watergum and you can find out more information from their website, www.watergum.org. Watergum also have a free online course explaining how to use this method effectively and it is strongly advised that you complete it prior to attempting tadpole trapping (see page 38).

NB: When not being monitored all traps should be removed.

Do	Do not
<ul style="list-style-type: none">• Complete the course and learn how to trap tadpoles successfully.• Wear gloves when handling lures and cane toads at all life stages.• Check your catch for by-catch – put these back in the water body.• Wash your trap with warm water and a sponge after each trapping session, rinse off any suds and leave to dry in the sun.• Keep tadpole lures dry and in a cool place away from pets and children.	<ul style="list-style-type: none">• Do not use traps unless cane toad tadpoles are visible.• Do not use leaky traps, you will waste your lures.• Do not allow the top of the trap to sit lower than the water level.• Do not let tadpoles die in the trap – dead tadpoles release a chemical that warns others away!• Do not move your trap and disrupt the scent plume.



Traps are placed at the edge of the water body where tadpoles aggregate. Do not set traps if cane toad tadpoles are not known to be present.



Photos: Watergum

Lures are placed inside the body of the trap to lead the tadpoles in through the funnels on the sides. Tadpole traps are successful at catching large quantities of tadpoles in a single trapping event.



COLLECTION METHODS

Metamorphs

Collecting metamorphs is extremely difficult as they are small (about 1 to 1.5 cm long) and often abundant. They are mostly active during the day, so that is the best time to search around the edge of water bodies where they tend to stay to avoid drying out. Be sure to check amongst sedges, reeds and long grasses. Be aware, they will disperse rapidly during wet periods or where there is sufficient surface water available.



Juveniles and adults

Manual collection

The most effective method for catching adult and juvenile cane toads is manual or hand collection. At night during the warmer months, you can locate cane toads via torchlight or by listening for their distinctive call. By scanning around the garden, paddock or dam, a good quality headlamp will pick up the eyeshine of toads.

Manual collection requires you to pick up the toad and put it in a lidded bucket or bag. Toads can be picked up using a plastic bag, gloves or even BBQ tongs or rubbish grabbers. If toads are in the water, a bait or dip net is the best way to capture them.

Check all permanent and temporary freshwater bodies, including ponds, pools, dams and even dishes under pot plants. Be quick, they will dive to the bottom if they detect your presence.

During the day you can search cane toad shelter sites. This can be done throughout the year as toads use them to take refuge until the weather is favourable.

Ethical handling

Despite what we think of cane toads, they should always be treated humanely. Collect and hold them in containers that are closed, adequately ventilated and insulated to protect the animals against temperature variations. Provide a small amount of water to keep them hydrated. Once you have correctly identified your capture as a cane toad, it should be euthanised as soon as possible after collection. It is against the law to be cruel to any animal, even invasive pests.

Familiarise yourself with the male cane toads' call. This will alert you to their presence. The call carries quite a distance so you may have to go searching. Be aware that males do not always call and may be quietly present in the landscape or calling infrequently.

Scan this QR code to listen to a male cane toad's call.



Photo: C. Kelehear

Trapping adults

There are a number of trap types that can be used for catching adult and juvenile cane toads. Pitfall traps consist of a buried container with an unstable lid or no lid. Cane toads are attracted to the trap via a solar operated light that draws in insects. These traps need to be checked daily for toads or other species that may have fallen in. Several DIY trap designs are available online.

Cage traps attract toads with a light and a sound lure playing a male

cane toad call to attract cane toads inside. Commercial traps such as the Toadinator™ are equipped with a solar panel to power the light and sound lure. Provided there is shade, food and water available for captured animals, cage traps can be placed in remote locations and checked every few days.

NB: When not being monitored all traps should be removed, closed or covered.

Photo: S. Kaiser



Photo: S. Forest

The 'Toadinator' has a small solar panel to power a light and play a recording of a cane toad call to attract toads to the trap.

HELP PROTECT OUR NATIVE FROGS

Native frogs are susceptible to a number of diseases and cane toads are known to be disease carriers.

Our local frogs have been impacted by chytridiomycosis, a disease caused by the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*). This disease can cause death in susceptible frog species and can rapidly decimate populations.

You must take some simple steps to minimise the risk of transmitting and spreading chytrid fungus and other diseases while searching for and collecting cane toads.

If you are collecting from multiple sites, the following recommendations will reduce the likelihood of spreading diseases between habitats or within and

among native frog populations. Spores of the chytrid fungus are transported via water and wet soil, so cleaning your equipment between sites and collection events is essential.

Please take the following precautions:

- Don't touch native frogs unless absolutely necessary, and never transfer them between sites.
- Clean and dry all your gear thoroughly - including nets, gloves, buckets, bags, torches and any other equipment.
- If you collect toads at more than one site, clean your gear before moving to another area. Alternatively, have separate buckets, nets, gloves and gumboot (or disposable shoe covers) for each location visited.
- Frogs are very sensitive to soaps and disinfectants, so be sure to rinse all your equipment thoroughly and make sure cleaning agents don't enter any water bodies.
- Clean mud off your footwear after every collection event or site visit. Ideally, thoroughly disinfect soles by standing shoes in a 5% bleach solution.

Green tree frogs (Litoria caerulea), below, and endangered giant barred frogs (Mixophyes iteratus), left, are susceptible to chytrid fungal disease.



Photo: G. Cook



Photo: A. Cook

If you find sick or dead frogs

If you observe a sick or dead frog, please email your observation (including photos and location information, if possible) to the Australian Museum's FrogID team at: calls@frogid.net.au

Collection of dead or sick frogs can greatly assist researchers to identify diseases and help to manage outbreaks.

Collecting sick or dying frogs:

- Do not use bare hands, preferably wear disposable gloves.
- Use a clean plastic bag or container for collection.
- If the frog is dead, keep it cool and freeze it as soon as possible.
- If the frog is alive, place it in a ventilated container with a small amount of water, then you should seek advice from the Australian Museum for information on the vets in your area that can provide treatment.



For more information scan to visit the Australian Museum.

Clean all equipment thoroughly between sites to reduce the risk of spreading disease.

Photo: K. McKay



TOADS ARE TOXIC!

Cane toad toxin looks like a white, sticky slime and is released from the glands behind their head. When handled, toads may release this poison and, although rare, can squirt it over a short distance.

Protect yourself....

Cane toad toxin is not fatal for humans but can cause skin irritation and burn the eyes. When handling cane toads, protective gloves and eyewear are recommended. Avoid touching your eyes, face and mouth, and wash hands and exposed skin thoroughly. If contact with the toxin occurs, flush the area with lots of water.



....and your pets!

The safest way to prevent cane toad poisoning is to keep your pets inside at night.

If poisoning occurs, early intervention is crucial. Symptoms to look for include frothing, reddened gums, wobbly legs, dilated pupils, vomiting and seizing.

The toxin will stick to your dog's tongue and gums if it mouths the toad. It is rapid-acting and the severity of symptoms will depend on the amount of toxin absorbed.

Act quickly! Prevent severe poisoning by removing the toxin from your dog's mouth as soon as possible. Use a wet cloth to wipe the dog's tongue and gums. Do not use a hose to flush the dog's mouth, as this can result in water in their airway. Monitor very closely for further symptoms. It is recommended that you consult with your vet when any poisoning has occurred.

Be Aware! Toxins remain present in dead toads and are still quite capable of killing animals that encounter them. The toxins break down very slowly and are only safe when they have decomposed.

Photo: K. C. Schneider



Photo: Watergum

When threatened, cane toads exude a milky, toxic substance from large glands on their shoulders. Always wear gloves when handling toads.

Photo: M. Johnson



Change your pet's drinking water every day and rinse the bowl well. Cane toads can release toxin into the water when they use pet dishes to hydrate. Remove left-over pet food too. Cane toads love it and will come for a feast.

Photo: G. Cook



If you suspect your pet has mouthed a cane toad, use a wet cloth to wipe their tongue and mouth thoroughly. You should also wash around their muzzle and eyes.

Photo: G. Cook



EUTHANASIA AND DISPOSAL

So you've caught a cane toad – now what? Cane toads must always be handled and disposed of humanely and thoughtfully.

It is illegal to cause undue harm to any animal. Euthanasia techniques must avoid distress, be reliable and produce rapid loss of consciousness without pain until death occurs.

Prior to euthanasia, cane toads should be held in adequately ventilated and insulated containers. Ensure there is some water in the container to stop toads from drying out. Cane toads must be euthanised as soon as possible and not contained for long periods of time. Before euthanising a cane toad, check your ID again. If you are unsure, please refer to the useful links and contacts at the back of this handbook.

Euthanasia

The RSPCA recommends the following methods as the most humane options available to the general public:

- **Cooling and Freezing** – Place the cane toad in a plastic bag or container in the fridge for at least 12 hours and then transfer to the freezer for 48 hours minimum. This method of euthanasia is recommended for tadpoles, metamorphs, juveniles and adult cane toads.
- **Eugenol** – This chemical can be sprayed on the toad's skin where it is absorbed, causing the toad to become sedated, then unconscious, followed by a relatively quick death. A product called Croaked is commercially available.
- **Hopstop** – Hopstop is a commercially available aerosol spray listed as conditionally acceptable. It is effective at killing toads, but some toads show signs of distress after its application.

Do not use chemical sprays in the environment. Only apply once you have toads in a container.

The use of Dettol, clubbing and drowning are considered inhumane methods.

When disposing of cane toads in the garbage use only the general waste bin (red bin). You must ensure they are dead to avoid transporting live toads to the waste facility.

Photo: D. Repschlagler



Cool tadpoles, metamorphs, juveniles and adults in the fridge for 12 hours. They should then be moved to the freezer for 48 hours.



Disposal

Cane toad carcasses must be disposed of carefully as they still pose a risk to humans, pets and wildlife. Once death has been established, carcasses can be discarded via burial, incineration or waste collection. The method you use will depend on local regulations and where you live.

- **Bury** – Carcasses can be buried in a deep hole so that they are not dug up by other animals. The hole should be at least 30cm deep. Dead cane toads do not harm plants.
- **Burn** – If you live on a rural property you may choose to incinerate cane toad carcasses. Be respectful of neighbours and check fire danger ratings before lighting a fire.
- **Bin** – In areas with waste collection you can put cane toad carcasses in the general waste bin. To prevent odours, freeze carcasses until the day of rubbish collection.

If large numbers of cane toads are to be killed, provisions should be made to dispose of carcasses appropriately. Some toad busting groups have a dedicated freezer for storing carcasses which are then taken to a council refuse facility. It is recommended to call ahead to ensure that the facility can accept animal remains.

RECORDING AND REPORTING

A Cane Toad Biosecurity Zone, managed by the Department of Primary Industries (DPI), was gazetted in 2019 under the NSW Biosecurity Regulation 2017. It is a tool to prevent and, where possible, eradicate cane toads in areas of NSW where they have not yet established.

Biosecurity and you

The NSW Cane Toad Biosecurity Zone includes all of NSW, except an area in the northeast corner of the state where cane toad populations are already established.

The Cane Toad Biosecurity Zone is the area on the map shown in RED and AMBER. The objective is to prevent the establishment, or to eradicate, cane toads that are found in the biosecurity zone. Everyone within the biosecurity zone has a duty to report sightings (even of a single animal) and help control cane toads.

The invasion front for cane toads is ever changing and a buffer zone (AMBER) has been created to help manage reports of cane toads at the invasion front. Different organisations will respond to reports of cane toads in the biosecurity zone depending on the location.

The GREEN zone indicates where cane toads are well established. Landholders in this area have a duty to ensure they do not transport cane toads into the biosecurity zone.

If you own or occupy land in the Cane Toad Biosecurity Zone you must:

- Notify the DPI of a new incursion as soon as possible
- Humanely destroy cane toads and prevent them from spreading from your land

If you see a cane toad in the Red area of the Biosecurity Zone you should:

Catch it:

- Don't harm it - it might be a native frog
- Take care - when stressed, cane toads can release poison from the large glands behind their head
- Wear protection when handling it - disposable gloves, long-sleeved shirt and eye protection
- If you can do so safely, keep it in a well-ventilated container with a little water. Keep in a cool location while you determine the species



Report it:

Take a photo



Record your location



Scan the QR code to report the detection using the 'Report an Unusual Animal' online form



What am I required to do?

Everyone in NSW has a duty to help manage cane toads. What you are required to do, and who you should report to, depends on where you encounter a cane toad. You can use the QR code on this page to identify which zone you are in, your obligations, and who you can report cane toad sightings to.

The Cane Toad Biosecurity Zone covers all of New South Wales, with the exception of the far northeast corner where cane toads are established.



Scan this QR code to go to an online interactive map.

RECORDING AND REPORTING

Recording cane toads

There are two handy platforms for recording cane toads and identifying native frogs. By recording cane toad sightings, you alert biosecurity agencies to the presence of cane toads in the biosecurity zone. This contributes to vital information about cane toad populations in northern NSW. Your phone can be a weapon in the fight.

ToadScan - sightings

ToadScan is a free and easy way of recording cane toad information from anywhere across Australia.

Individuals and community groups can use ToadScan to report cane toads to biosecurity authorities and capture information about cane toad activity and control efforts. This can be used to inform decisions about local cane toad management.

You can view community records of cane toads or add a new sighting to the website here:
www.toadscan.org.au



The ToadScan mobile app works anywhere and does not require mobile phone reception.

You can record:

- Sightings (e.g. adults, eggs, calls)
- Photos of toads
- Impacts (e.g. dead wildlife)
- Method of control used

Download the ToadScan app by scanning one of the QR codes below.



FrogID - calls

FrogID is a national citizen science project helping to identify, map and understand Australian frog species. FrogID is run by the Australian Museum.

Each frog and toad species has a unique call that can be used to identify them without having to find them. The FrogID app allows you to record these calls and submit them for identification to frog experts at the Australian Museum. If the museum's FrogID team identify cane toad calls recorded in the biosecurity zone they will alert the DPI.

The app is also a handy tool for identifying frog species - you can listen to frog calls and look at photos of frogs. It can be used to help distinguish between a cane toad and a native frog.



By submitting frog and toad calls to FrogID you are helping:

- Establish a nation-wide data base of frog calls;
- Monitor frog distributions over time to see how frogs are responding to environmental change;
- Inform conservation and species management.



Scan this QR code to download the FrogID app.

TOAD-PROOF YOUR PROPERTY

You can take some simple steps to reduce the risk of cane toads invading your home or property.

Keep toads out

Cane toads are not good climbers and are unable to leap large distances – a barrier made of a smooth, solid material about 50 cm high and secured into the ground will keep cane toads out of your yard.

Check your load – ‘stowaway’ cane toads are known to travel in building materials, green waste, woodchip or mulch, soil and pot plants. Unload in a clear area and check after dark for any unwelcome visitors.

Cane toads can be accidentally transported to new locations. If you are travelling from cane toad infested areas, ensure that you are not carrying any hidden or trapped toads in your luggage, vehicle or trailer. Check all of your camping equipment thoroughly before folding and loading it for travel.

Remove toad temptations

- Don't leave pet food out – cane toads love it!
- Remove standing water - toads need access to water every couple of days to rehydrate.
- Remove anything that toads can shelter under during the day.
- Turn your outside lights off when not needed - lighting attracts moths and other insects for them to feast on.

- Don't turn on irrigation or sprinklers at night.
- Ideal breeding sites for cane toads are slow-moving or still water bodies with gently sloping or flat access, and open ground with minimal edge or overhanging vegetation. Consider planting to deter cane toads.

A bright idea!

Lighting can also be used to attract toads! You may ask why you would want to attract them. Cane toads can be drawn into lit areas where they can be more easily collected. If toads are in your area, they will come to feast on the insects around the light. Set aside a day each week to light an area of your yard. Head out after dark to see who has dropped in for a meal.

Toad proof your dam

Farm dams are ideal breeding sites as stock keep the vegetation down, and animal dung attracts insects providing food sources for cane toads.

To help make dams less attractive to cane toads you can:

- Provide stock with raised, off-dam water points;
- Establish dense plantings of water and edging plants;
- Plant trees to overhang and cool dams;
- Design dams with steeper banks;
- Consider fencing dams with low toad exclusion fencing.

Waterbodies that are inaccessible to cane toads include:

- Steel or plastic tanks filled from pipelines
- Raised troughs



Bare Twig Rush
Baumea juncea

Twizzler
Lepironia 'Twizzler'



Common Rush
Juncus usitatis



Grey Sedge
Lepironia articulata



Exclusion fence

WATER PLANTS

Common Rush (<i>Juncus usitatis</i>)	M
Knobby Club Rush (<i>Ficinia nodosa</i>)	B,M
Tall Saw Sedge (<i>Gahnia clarkei</i>)	B,M
Tall Sedge (<i>Carex appressa</i>)	B,M
Bare Twig Rush (<i>Baumea juncea</i>)	M
Grey Sedge (<i>Lepironia articulata</i>)	0.5 - 1 m
Lepironia 'Twizzler'	0.25 - 0.5 m

MORE INFORMATION

There are many useful resources available on the internet that will assist with correct identification and reporting of cane toads. There are also a number of social media interest groups that you can follow.

Identification

Watergum: www.watergum.org/cane-toad-or-native-frog/

Australian Museum: www.frogid.net.au/frogs

FeralScan: www.feralscan.org.au/toadscan/

Tadpole identification: CTC Cane Toad Tadpole Identification Guide
www.imb.uq.edu.au/files/16159/CTC%20Cane%20Toad%20Tadpole%20Identification%20Guide.pdf

Trapping information and training

Watergum: www.watergum.org/courses/watergum-cane-toads/

Euthanasia

RSPCA: www.kb.rspca.org.au/knowledge-base/what-is-the-most-humane-way-to-kill-a-cane-toad/

Landcare Control Projects

BRRVLN - Border Ranges Richmond Valley Landcare Network Inc.
www.brrvln.org.au/

Clarence Landcare Inc.
www.clarencelandcare.com.au/

Biosecurity

If you live in NSW you have a biosecurity duty to help control cane toads. Visit the DPI website to check your obligations on their interactive map.
www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/nia/key-new-incursions-species/new-incursions/cane-toad

Research

See the research being conducted by Professor Rick Shine and members of his research group from Macquarie University, TEAM BUFO:
www.canetoadsinoz.com/

Social media

The following Facebook groups are also great for cane toad identification:

- CVCIA Landcare and Rappville Toadbusters
- Frogs and Toads Identification Australia.

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Watergum: watergum.org/courses/watergum-cane-toads/ (accessed 6 Oct. 2021)

Other references:

Australian Museum: www.frogid.net.au/frogs

www.canetoadsinoz.com/

<https://www.environment.gov.au/system/files/resources/1e8d9000-4bf3-4cdb-9b21-abe243a0473b/files/frogs-hygiene-protocols.pdf> (accessed 25 Sept. 2021).

