

Saving the Critically Endangered spotted tree frog following the 2019–20 bushfires

NESP Threatened Species Recovery Hub Project 1.4.1

KEY MESSAGES

- Spotted tree frogs have suffered major declines, are now Critically Endangered in Victoria and New South Wales, and will become extinct unless we take action.
- Before the 2019–20 bushfires remaining populations were rare and had low resilience, particularly due to predation by non-native fish and disease caused by chytrid fungus.
- Spotted tree frogs can be killed during bushfire events, and their eggs and tadpoles can also be killed after fire if rainfall washes ash, sediment and debris into mountain streams, causing a black water event where this frog species breeds.
- The 2019–20 bushfires burnt 50% of sites used by spotted tree frogs, and high rainfall caused flooding and blackwater events after the fires.
- While the bushfire, post-fire flooding and blackwater events likely directly killed many frogs, eggs and tadpoles, a high proportion of frogs were also found to be infected by chytrid fungus during post-fire surveys.
- These post-fire surveys found that spotted tree frog populations were reduced to critically low numbers at severely burnt sites.
- The number of frogs at some sites were so low that researchers decided to salvage remaining individuals.
- Spotted tree frogs were collected from these sites, and neighbouring populations, to establish a captive conservation breeding and insurance population at Zoos Victoria.
- The frogs collected were mostly juveniles and from multiple sites to reduce the potential impact on the remaining wild populations and to maximise the genetic diversity of the captive founder population.
- Captive-bred spotted tree frogs will eventually be released back to help increase the resilience of wild populations to existing threats like chytrid fungus, and future fire events.

Understanding the problem

The spotted tree frog is found in freshwater streams in northern-eastern Victoria and southern New South Wales. This Critically Endangered species has disappeared from 50% of its known former sites, is rare at all these remaining sites, and is expected to become extinct unless we intervene.

Non-native fish and chytrid fungus are the two key threats to its persistence.

- **Non-native fish** (brown trout, rainbow trout, European carp and redfin perch) eat spotted tree frog tadpoles. The native fish species (blackfish) rarely eat the tadpoles.
- **Chytrid fungus** causes a disease called chytridiomycosis that kills adult frogs, and frogs at earlier life stages.

Bushfires can have devastating impacts on wildlife populations. Spotted tree frogs often use vegetation on the banks of mountain streams as shelter sites. If the frogs are sheltering in vegetation during bushfires, they can be killed when the vegetation burns, but they may also be killed by radiant heat if using other shallow shelter sites. Post-fire rain can wash ash, debris and sediment into mountain streams after fire events. When this material reduces dissolved oxygen in the water it is known as a blackwater event.

A spotted tree frog nestled between burnt logs after the Black Summer Fires. Image: Matt West





Understanding the problem (continued)

Spotted tree frogs breed only in mountain streams, and if the post-fire flooding causes a blackwater event when eggs and tadpoles are in the streams then an entire generation can be killed.

Given that spotted tree frog populations are small, isolated and face multiple threats, they are unlikely to cope with severe bushfire events. This is because spotted tree frog populations are very unlikely to naturally recover if any event further reduces their recruitment rates. Furthermore, spotted tree frogs cannot recolonise sites, as the distance between all remaining populations is greater than the distance they can naturally disperse. Even low-to moderate-intensity bushfires may accelerate population declines of spotted tree frogs if fires reduce the survival of frogs and disrupt their breeding.

Who is involved?

- Department of Agriculture, Water and the Environment
- Victorian Government Department of Land, Water and Planning
- Forest Fire Management Victoria
- Parks Victoria
- The University of Melbourne
- Zoos Victoria
- Cadbury Freddo
- New South Wales Office of Environment, Energy and Science Saving Our Species Program

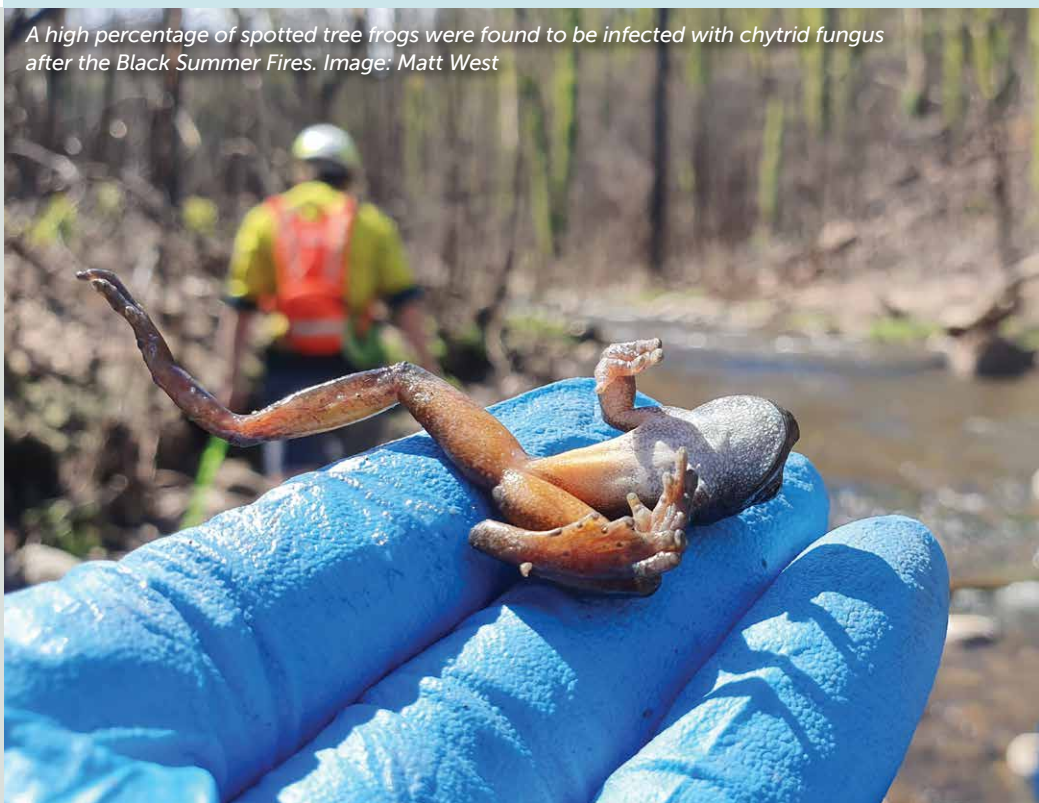
The impact of the 2019–20 bushfires on wildlife

Severe drought up to spring 2019 led to an extreme fire season in southern and eastern Australia. The 2019–20 bushfires burnt over 104,000 km², including approximately 20% of the forest biomes, much of it severely. Aquatic habitats within and downstream of burnt areas were also heavily impacted.

Three billion reptiles, mammals, birds and frogs are estimated to have been impacted by the bushfires, and many were killed during the fires. Animals that survived the initial fire event may have later died from lack of resources (food, water, shelter), heavy sedimentation and water quality deterioration in aquatic environments, and increased exposure to predation, competition and disease.

Thirty-eight frog species, including the spotted tree frog, had 25% or more of their habitat burnt by the fires. Experts have predicted that in the absence of conservation action, the immediate and subsequent effects of the bushfire will drive a further 35–62% reduction in remaining spotted tree frog populations over the next 10 years (or three generations). While the spotted tree frog is recognised as Critically Endangered in both Victoria and New South Wales, the recent fire event further supports recommendations that the national conservation status of spotted tree frogs (Endangered) also be up listed to Critically Endangered.

A high percentage of spotted tree frogs were found to be infected with chytrid fungus after the Black Summer Fires. Image: Matt West



About chytrid

Chytrid fungus is found at the sites of all the remaining spotted tree frog populations.

The fungus originated in south-east Asia and spread around the world, likely arriving in Australia in the 1970s.

Globally, chytrid has affected 700 species of amphibian, with at least 500 of those suffering declines as a consequence.

Chytrid has a free-swimming zoospore life stage that is

microscopic and can persist in the environment. Not all frog species are equally affected by chytrid. Frog species that are less susceptible to infection and developing disease can carry and spread chytrid to the detriment of other, more susceptible, frog species.

While we can treat individual frogs for chytrid infection in captive situations, we can't yet eliminate chytrid from wild populations.



The spotted tree frog is highly susceptible to developing disease caused by chytrid fungus.
Image: Matt West

Emergency salvage and establishing a captive conservation breeding colony

Captive insurance and conservation breeding programs can help protect species when their wild populations reach critically low numbers and their threats cannot be eliminated. Researchers from The University of Melbourne and Victorian Government Department of Land Water and Planning collected 27 spotted tree frogs to establish a captive insurance and conservation breeding program at Zoos Victoria. The frogs were collected from four different sites to maximise the genetic diversity of the founders for the new breeding program. Three of these four populations had been affected by bushfire to differing degrees. At one site, researchers may have collected the last remaining individuals.

Mostly juvenile frogs were collected, as this was considered to have the least impact on the remaining wild populations.

In addition, these juvenile frogs are expected to have a better chance of surviving to the adult stage in captivity than they do in the wild. Under current conditions, in the wild only around 0.4% of eggs produced by female spotted tree frogs survive to become adult frogs. Given that females produce around 500 eggs per year, this means that only around two of these will reach the adult breeding life stage. A key reason for the low survival of the eggs and tadpoles in the wild is because they are eaten by non-native fish. Furthermore, to contribute to the next generation, the adult frogs must also survive, avoid succumbing to chytrid infection, and then breed.

The collected spotted tree frogs will undergo a strict quarantine period at Zoos Victoria's Healesville Sanctuary to ensure they are all chytrid-free before entering the captive-breeding program.

New, specialised captive-breeding facilities are being constructed at Healesville Sanctuary and Melbourne Zoo thanks to the Australian Government's Bushfire Recovery for Wildlife and their Habitats grant funding and donations received from the community after the fires and a special funding campaign by Freddo Frog. Once the captive frogs mature, the breeding program will help to produce frogs for future reintroduction and translocation trials at key wild release sites. Ultimately, we hope this will increase the resilience of spotted tree frogs to future fire events.



Reference

West, M. & Johnson, G. (2021) BBRR Theme 1: Immediate reconnaissance – Activity AG1.1: Threatened reptiles and frogs. Post-fire assessment report: Spotted Tree Frog & Booroolong Frog. Bushfire Biodiversity Response and Early Recovery Program, Department of Environment, Land, Water and Planning, Hume Region, NE Victoria & University of Melbourne.

What else are we doing? And how can you help?

We will continue to monitor the fire-affected spotted tree frog populations to determine how they respond after the fires and to the other ongoing threats, and so that we can be ready if they need our help.

To increase the resilience of spotted tree frog populations to future fire events we are also working to reduce the key threats. This includes reducing the numbers of non-native fish at one important site for the spotted tree frog. Changes in the spotted tree frog population

will be assessed in response to non-native fish removal as [part of a five-year \(2021 to 2026\) management trial](#). The trial is being conducted at a site of relative low value to anglers but high value to recovery of the spotted tree frog.

Spotted tree frogs need urgent help to protect them from disease caused by chytrid fungus. We are trying to find some frogs that can survive chytrid infections, and undertaking research to discover the genetic mechanisms that help them survive.

If we can identify these frogs, then we can selectively breed them in the new captive conservation breeding colony at Zoos Victoria. We plan to release spotted tree frogs back into the wild that can fight chytrid infections. Populations that can deal with chytrid are expected to be more resilient to future bushfire events. To achieve this, we need additional funding support.

If you would like to help this critical research, please contact the spotted tree frog research team.



Severe bush fire, post-fire floods and disease appear to be accelerating spotted tree frog declines. Image: Matt West

More information

We encourage your feedback. Contact the research team: SpottedTreeFrog-Project@unimelb.edu.au



National Environmental Science Programme

Cite this publication as West, M, 2021. Saving the Critically Endangered spotted tree frog following the 2019–20 bushfires. Project 1.4.1 community factsheet. NESP Threatened Species Recovery Hub, Brisbane.

This research project was funded through the Australian Government's Bushfire Recovery package for wildlife and their habitat, the Victorian Government's Bushfire Biodiversity Response and Recovery program (Phase 1), Zoos Victoria and the Threatened Species Recovery Hub of the Australian Government's National Environmental Science Program.