



Hochstetter's Frog Pepeketua

IMPACTS OF HABITAT LOSS

NZFrogs is a charitable trust which aims to help people of all backgrounds and abilities learn about, engage with and support the conservation of New Zealand's native *Leiopelma* frogs.

In 2024, NZFrogs received funding through the Unlocking Curious Minds Contestable Fund to develop a series of educational booklets and accompanying posters. The goal for these resources is to provide engaging, bilingual resources that communicate years of scientific research, to a wide age range. Hopefully, you will find these resources are useful in your community and classrooms, and appealing to anyone interested in learning more about native *Leiopelma* frogs.

The *Pepeketua of Aotearoa* series includes four booklets with accompanying posters. Additionally, there are two special topic posters: *What makes our Pepeketua special?* and *Protecting our Pepeketua*. You can find out more about NZFrogs and the *Pepeketua of Aotearoa* series at nzfrogs.org

NZFrogs worked alongside a talented team to bring *Pepeketua of Aotearoa* to life:

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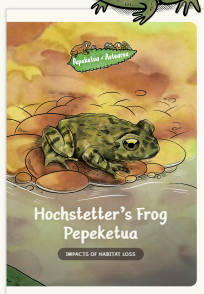
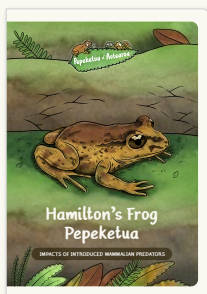
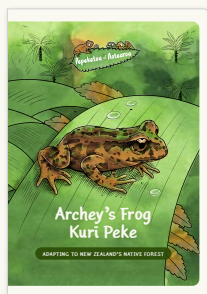
We would also like to acknowledge the following iwi for their contributions to these resources: Pare Hauraki, Ngāti Kuia, and Ngāti Koata.

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ISBN 978-1-0670522-2-5

This booklet is about me!



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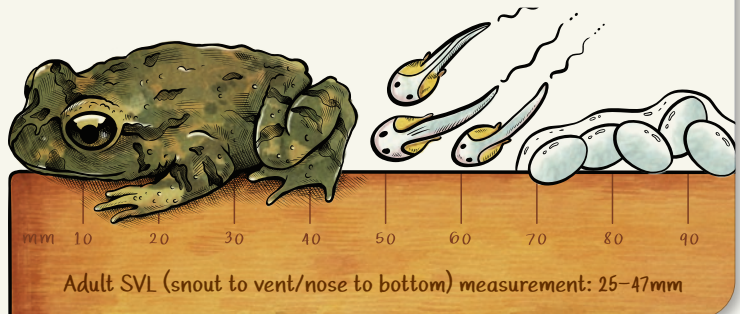
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CREATURE CARD

Hochstetter's frog is New Zealand's only native, semi-aquatic frog. Check out the other booklets in the *Pepeketua of Aotearoa* series or nzfrogs.org to learn more about New Zealand's native frogs.

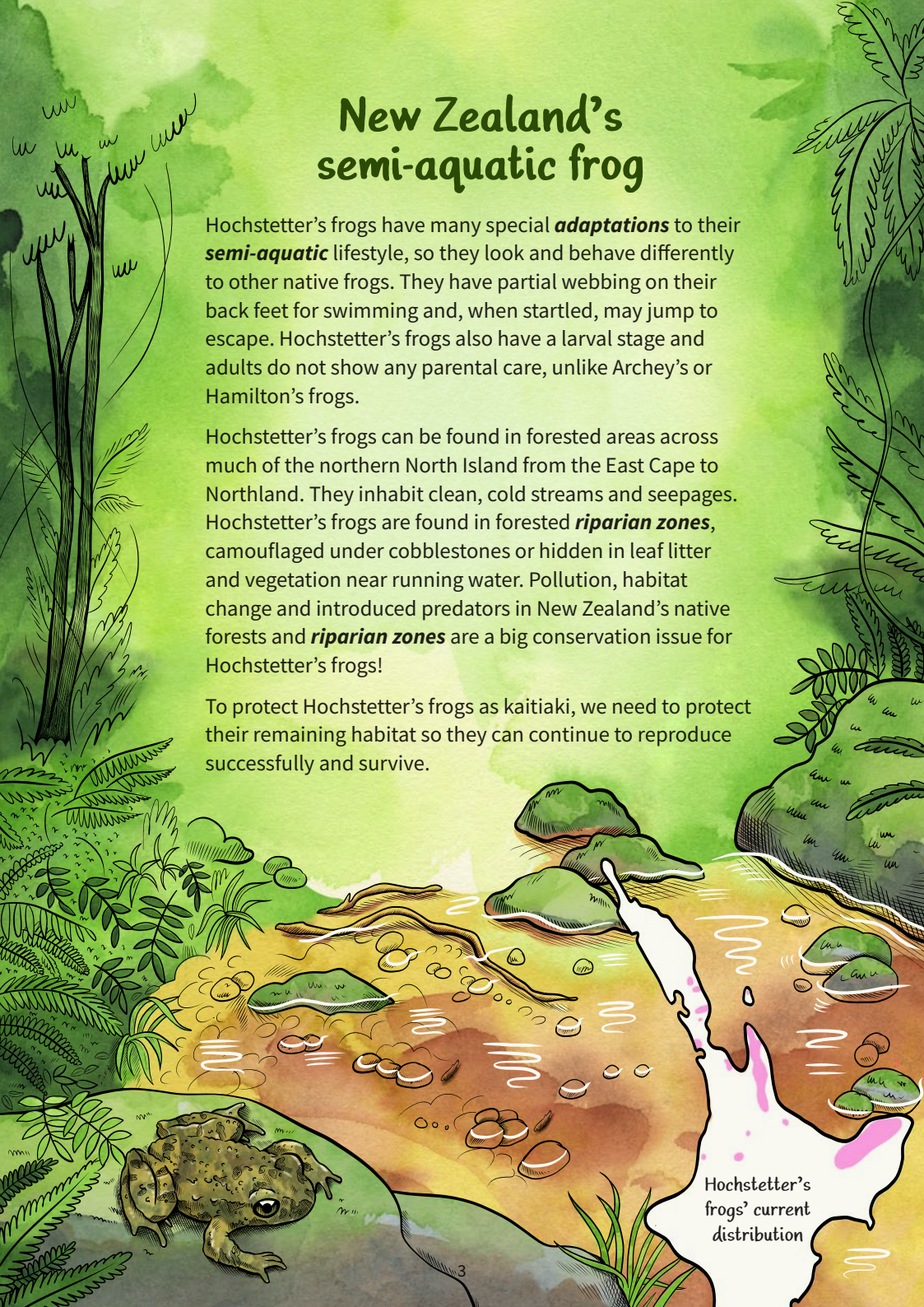


New Zealand's semi-aquatic frog

Hochstetter's frogs have many special **adaptations** to their **semi-aquatic** lifestyle, so they look and behave differently to other native frogs. They have partial webbing on their back feet for swimming and, when startled, may jump to escape. Hochstetter's frogs also have a larval stage and adults do not show any parental care, unlike Archey's or Hamilton's frogs.

Hochstetter's frogs can be found in forested areas across much of the northern North Island from the East Cape to Northland. They inhabit clean, cold streams and seepages. Hochstetter's frogs are found in forested **riparian zones**, camouflaged under cobblestones or hidden in leaf litter and vegetation near running water. Pollution, habitat change and introduced predators in New Zealand's native forests and **riparian zones** are a big conservation issue for Hochstetter's frogs!

To protect Hochstetter's frogs as kaitiaki, we need to protect their remaining habitat so they can continue to reproduce successfully and survive.



Hochstetter's
frogs' current
distribution

Hochstetter's frog life cycle

Metamorphosis is a distinctive process seen in amphibians where they develop from a larval tadpole stage to a fully developed adult. The lifecycle of Hochstetter's frogs is dependent on their **semi-aquatic** habitat, but they lack a true tadpole stage!

Hochstetter's frogs are long-lived. It will be about 4 years before froglets mature and breed for the first time.



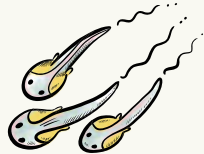
Females lay two egg strings in water along the stream's edge.



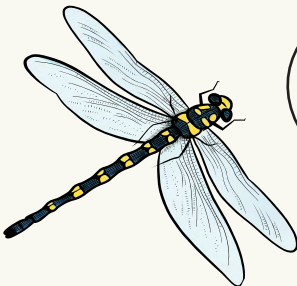
After **metamorphosis**, froglets are tiny versions of adults; they are just under 1cm long!



Males fertilise these eggs but provide no parental care. After 40 days the larvae hatch.



Hochstetter's frog larvae are fully **aquatic** but are not tadpoles! Tadpoles are active and feed on algae or **aquatic** insects. Hochstetter's frog larvae do not feed at all, relying entirely on a **yolk sac** for another 50 days.



There are observations where Hochstetter's frogs have laid their eggs in tunnels dug by large bush dragonfly nymphs!



Life at night



Hochstetter's frogs are **cryptic**, just like all *Leiopelma* frogs. Their lumpy skin with varied shades of green, brown, and grey helps them disappear among rocks and vegetation. Hochstetter's frogs are nocturnal and emerge at night to feed on small **invertebrates**.

Hochstetter's frogs are prey for many native and introduced animals. Native predators primarily hunt using sight. Because Hochstetter's frogs are **cryptic**, they can avoid predation by staying perfectly still. Introduced mammalian predators are a different problem as they use smell to find their prey, so they have no problem finding Hochstetter's frogs!

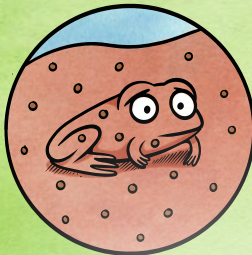
Native frogs don't croak to communicate like most frogs. Instead scientists believe they may use **pheromones** or chemical signals.

The riparian zone

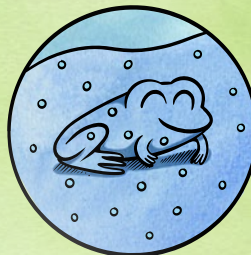
Riparian zones are the transitional zones between **terrestrial** and **aquatic** ecosystems. They exist along rivers, streams, lakes or other water bodies. Many specialist plants and animals live in the **riparian zone** and help stabilise **aquatic** ecosystems. Hochstetter's frogs rely on the **riparian zone** for survival.

As larvae, Hochstetter's frogs require clean seepages, pools, and crevices along stream banks. Larvae have under-developed lungs and gills. Because of this, they find it difficult to breathe if there is too much suspended sediment at the nest site. Sediment increases can occur when **riparian zones** are damaged by land use changes and by pig or deer wallowing.

Polluted water



Clean water



Frogllets and adult Hochstetter's frogs also use **riparian zones**. During the day frogs use **retreat sites** between or under cobblestones, boulders, and fallen vegetation. At nighttime, they use the **riparian zone** to forage for **invertebrates**.

Adult Hochstetter's frogs can sometimes be found with Archey's frogs! Both frogs live in native forests and may even use the exact same daytime **retreat site**.

Historical land use change

Hochstetter's frogs are specially **adapted** to the **riparian zone** within native forests. Before human settlement, over 80% of New Zealand was covered in dense native forest. Native forests have streams that are cold and clean. They are ideal for Hochstetter's frogs!

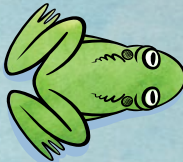
Today, only about 24% of New Zealand is covered in native forest. New Zealand is home to over five million people with much of our land used for agriculture or urban development. Such massive changes have negatively impacted the ecosystems of native forests. Hochstetter's frog populations became **fragmented** and declined when large areas of native forest were cleared.



Hochstetter's frogs swim with alternate kicks using only one leg at a time with their arms extended in front of them. This technique is less efficient than other frogs that use a 'frog breaststroke'.



Most frogs



Hochstetter's frogs

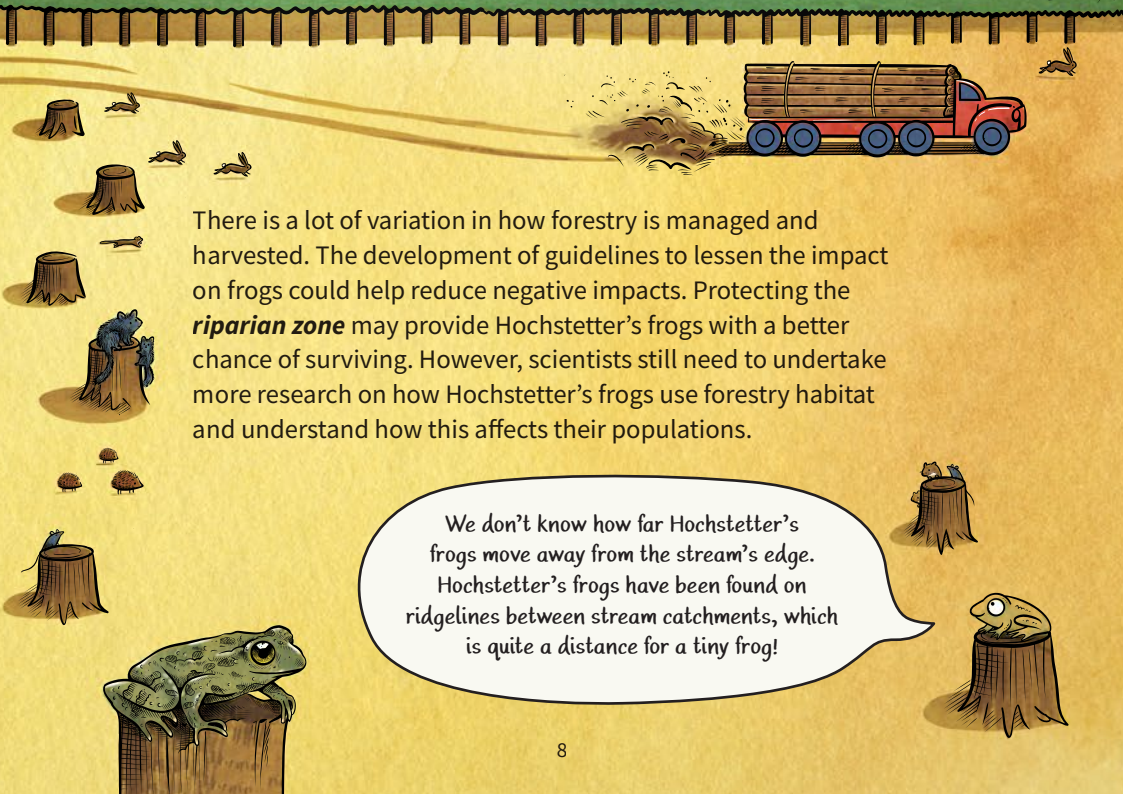




Impacts of forestry

Hochstetter's frogs can be found surviving in pine forestry blocks. However, frog populations in forestry blocks don't always do well. Pine forests generally provide less frog shelter, have less **riparian** vegetation, and are less resilient to flooding, when compared to native forests. Populations can struggle to grow because of high levels of erosion and suspended sediment that can damage nest sites, clog up daytime **retreat sites**, and reduce the number of **invertebrates** for frogs to eat. More sun exposure also increases water temperatures and **evaporation**.

Hochstetter's frogs in forestry blocks are threatened with local extinction every 25–30 years when pine trees are harvested. Pine harvesting removes forest cover, reduces the availability of daytime **retreat sites** and increases sun exposure. Machinery used to harvest forests and dragging logs disturbs the soil which can cause large amounts of sediment to enter waterways.



There is a lot of variation in how forestry is managed and harvested. The development of guidelines to lessen the impact on frogs could help reduce negative impacts. Protecting the **riparian zone** may provide Hochstetter's frogs with a better chance of surviving. However, scientists still need to undertake more research on how Hochstetter's frogs use forestry habitat and understand how this affects their populations.



We don't know how far Hochstetter's frogs move away from the stream's edge. Hochstetter's frogs have been found on ridgelines between stream catchments, which is quite a distance for a tiny frog!



Impacts of mining

Mining causes many environmental issues globally, which can negatively affect frog populations.

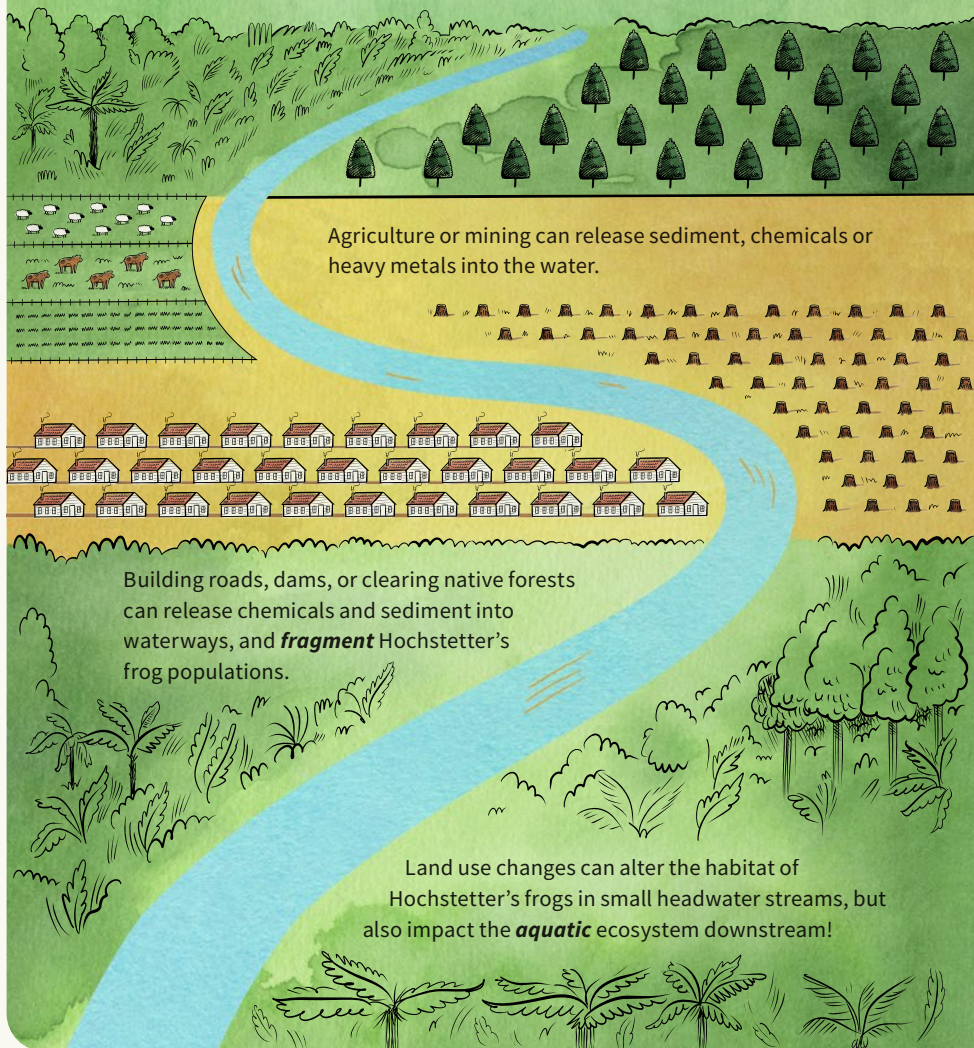
In New Zealand more research is needed to understand the impacts of mining on *Leiopelma* frogs before it's too late.

Open-cast and underground mines can reduce the amount of available habitat, especially for frogs which rely on the **aquatic** environment like Hochstetter's frogs! Open-cast mines clear areas of vegetation, whereas underground mines can cause damage to the underground water table or cause streams to crack and drain, which can alter the flow of water. Mines can also pollute waterways with dissolved minerals, impacting stream health.

If *Leiopelma* frogs are going to survive, land managers and developers must collaborate with the Department of Conservation, iwi, and scientists to protect us.

Downstream impacts

Downstream impacts are the indirect consequences of habitat loss or land use changes that have occurred upstream. Rivers often start as clean, cold streams deep in native forests. Rivers become polluted as they pass through forestry, farms, and urban settlements.



Conservation efforts

Despite being our most widespread *Leiopelma* species, Hochstetter's frogs receive the least amount of conservation attention. Hochstetter's frogs have benefited from predator control targeted at native birds in the Hunua Ranges, near Auckland. At Sanctuary Mountain Maungatautari an entire predator-proof fence was established before Hochstetter's frogs were even discovered!

Hochstetter's frogs benefit from predator control but we also need to ensure that native forests where *Leiopelma* live are protected and restored. Restoring **riparian zones** along headwater streams helps increase the health of the **aquatic** ecosystem downstream too! By volunteering to help restore the **riparian zone** or to undertake predator control, you can help Hochstetter's frogs.

Monitoring frog populations and habitat conditions can help to determine which conservation techniques benefit specific *Leiopelma* frogs the most. Scientists have put radio trackers on all three *Leiopelma* species to learn about how far and where in the forest they move!

Glossary

<i>Adaptation (adapt)</i>	An evolutionary process by which an organism becomes more suited to its environment.
<i>Aquatic</i>	Relating to, or associated with, water.
<i>Cryptic</i>	In ecology, cryptic describes an organism which possesses physical or behavioural characteristics which serve to conceal its presence or activity.
<i>Evaporation</i>	The process by which water becomes a vapour, below its boiling point.
<i>Fragmentation (fragments)</i>	A process where a large continuous, or connected, population is separated into smaller, isolated populations.
<i>Invertebrates</i>	Describes animals that have no backbone; for example: spiders, flies, snails, or peripatus.
<i>Metamorphosis</i>	A drastic developmental change of an animal, physically and behaviorally; for example, when a butterfly develops from a caterpillar, or a frog develops from a tadpole.
<i>Pheromones</i>	A chemical secreted by an animal which affects the behaviour of other individuals of the same species.
<i>Retreat sites</i>	A location, or site, where <i>Leiopelma</i> hide while inactive over the day or during dry weather.
<i>Riparian zone</i>	The area or transition zones between terrestrial and aquatic ecosystems.
<i>Semi-aquatic</i>	Describes an organism that regularly uses both terrestrial and aquatic environments.
<i>Terrestrial</i>	An organism that lives or grows on land.
<i>Yolk sac</i>	A membranous structure that provides growing larvae with food.





How can you help New Zealand's native frogs?

Tell anyone you know everything that you've learnt about Hochstetter's frog. The more people that know, the more that people will care!

Keep learning about native frogs. There are three more booklets in the *Pepeketaua of Aotearoa* series: *Archey's Frog*, *Hamilton's Frog*, and *Extinct Native Frogs*. You can also visit the **nzfrogs.org** website.





Hochstetter's frog (*Leiopelma hochstetteri*) is one of New Zealand's last remaining native frogs. These special frogs are perfectly adapted to New Zealand's native forest, but their populations are declining! Learn about the riparian zone, and how Hochstetter's frogs are affected by land use changes in New Zealand.

With the support of experts and specialists, the NZFrogs team have developed a set of resources to educate, inspire, and help everyone on their journey to become *Leiopelma* native frog kaitiaki!

**CURIOUS
MINDS**

HE HIIHIRI I TE MAHARA



ISBN-13: 978-1-0670522-2-5



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