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## Post-Fire Conservation Action for the Endangered Littlejohn's Tree Frog (*Litoria littlejohni*) | Nadine Nolan

As a result of human actions, our precious wildlife is under serious threat, resulting in a rapid decline in biodiversity globally. There is an exceptionally high loss rate among amphibian species compared to other types of animals. Chytridiomycosis, a disease caused by the fungus *Batrachochytrium dendrobatidis*, is the leading cause of amphibian extinctions. However, the situation has been made worse by climate change-induced droughts and extreme temperatures, habitat loss and fragmentation, and the spread of invasive species. Consequently, amphibian populations are under immense pressure, which poses significant concerns for their long-term survival.

In Australia, the 2019-2020 black summer bushfires severely impacted specific populations of the Littlejohn's tree frog (*Litoria littlejohni*), a species already threatened by chytridiomycosis, mining, and habitat

loss. Over the last decade, sightings of this species have declined further. However, researchers had no idea how dire the situation was until we discovered their populations were highly isolated and extremely small. Recent genetic analysis of the Littlejohn's tree frog populations revealed significant inbreeding, with only three populations remaining in New South Wales. Dedicated research efforts are underway to protect the Littlejohn's tree frog from extinction.

The project aims to use promising *in-situ* (on-site) and *ex-situ* (off-site) conservation methods to enhance the genetic diversity and size of small, isolated populations in the Blue Mountains and Watagan Mountains, New South Wales. These methods include the creation of additional breeding ponds, establishing a breeding program, using assisted

reproductive technologies, and head-starting of propagules (releasing baby frogs back into the wild). Research into conserving the Littlejohn's tree frog is part of a collaborative project within the Conservation Science Research Group at The University of Newcastle.

In the Watagan Mountains, where the Littlejohn's tree frog is experiencing higher rates of inbreeding depression, we have collaborated with NSW National Parks and Forestry Corporation to create clusters of various-sized ponds. A single pond can only support a limited number of tadpoles. Therefore, breeding can be limited by the availability of ponds as well as the number of adults ready to mate. The Littlejohn's tree frog and many other frogs can be particular when choosing a breeding pond and tend not to like fast-running water and the presence of fish. However,



A juvenile Littlejohn's tree frog (*Litoria littlejohni*) in the Watagan Mountains, New South Wales. Image: Penny Harnett.



these frogs need ponds that have water almost all year round, resulting in the correct type of pond being limited in the landscape. Therefore, one of the research objectives is to create artificial ponds to increase breeding habitat availability, thus increasing the overall population size. The Watagan frog population is being monitored before and after the pond creation to measure any increases in population size.

Among the most important aspects of the research is improving our understanding of the breeding biology of the Littlejohn's tree frogs. The project focuses on understanding the link between genetic diversity and reproductive health in male Littlejohn's tree frogs. Evidence suggests that low genetic diversity and inbreeding reduce individual fitness traits and the viability of populations by limiting their ability to adapt to environmental change (e.g., climate change, drought, fire, and disease). The study will employ innovative assisted reproductive technologies and genetic information of individual frogs to enhance the selection process for breeding pairs to determine whether increasing genetic diversity correlates with improving sperm quality. Given the potential detrimental effects of inbreeding on reproductive fitness, understanding the link between sperm quality and genetic diversity is paramount for managing threatened species. The knowledge gained from this research will be highly significant for the breeding program's success, as it will ensure the production of reproductively strong individuals for future release into the wild.



Nadine Nolan releases a juvenile Littlejohn's tree frog (*Litoria littlejohni*) back into a pond in the Watagan Mountains. Image: Penny Harnett.

Efforts to save the Littlejohn's tree frog are vital for this unique species and serve as a beacon of hope for other threatened wildlife. By collaborating with other researchers, citizen scientists, park rangers and land

managers to implement proactive conservation strategies, we can make a real difference in protecting Australia's remarkable biodiversity for future generations.



Dr Alex Callen stands next to the newly constructed artificial pond created to boost the Littlejohn's tree frog (*Litoria littlejohni*) population in the Watagan Mountains. Image: Nadine Nolan.