

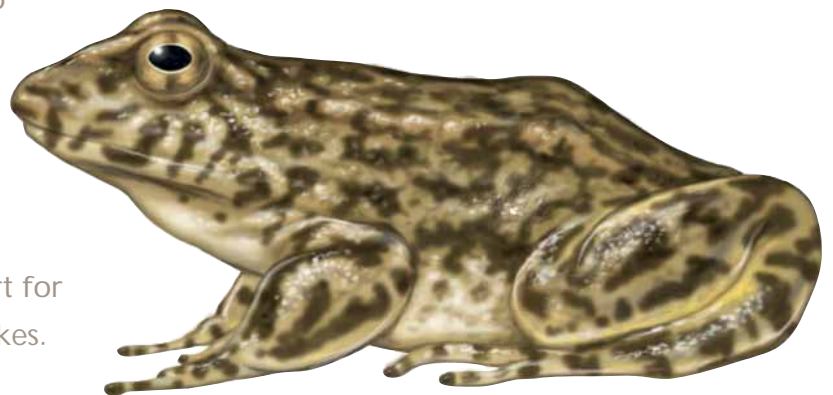


Yosemite valley, river, Yosemite National Park, California © David Noton/npl/Minden Pictures

Climate change predictions for the region suggest altered precipitation patterns that will lead to less snowpack in the Sierra Nevada, a development that would be dire for the frogs.

Yellow-Legged Frogs of the Sierra Nevada mountains

The mountain yellow-legged frog was once one of the most abundant vertebrates in the Sierra Nevada. The flash of its yellow legs could be seen and the echo of its croaking could be heard across the Sierra's alpine lakes, even those nestled at 12,000 feet that contain watery habitats typically too cold for amphibians. Unfortunately, that empire began to crumble as long ago as 1850 when non-native trout were first transplanted into some of those lakes to increase fishing opportunities. The introduced fish found the frogs and their offspring to be delectable. Fish stocking became more vigorous in the 1920s when the State of California took control of the program; in the 1950s the program was stepped up again as ground crews transplanting trout received aerial support for stocking some of the high backcountry lakes.



For “Climate Smart” Management, Bigger Isn’t Necessarily Better

Nestled between its national park neighbors in the Sierra Nevada, **Devils Postpile National Monument** is demonstrating that even small parks can adopt “climate smart” management. At just 800 acres, the park is nevertheless biologically rich, with roughly 400 plant species and 100 bird species, and is a mixing point for such eastern and western Sierra vegetation as Red fir, sagebrush, and Great Basin juniper. In spite of the park’s small size, Devils Postpile Superintendent Deanna Dulen is working to develop a General Management Plan designed to, in effect, turn the monument into a refuge of sorts from climate change. Working with officials from the Inyo National Forest, which surrounds the monument, Superintendent Dulen hopes to develop a plan that will guide management for the next 20 years of not just the monument’s 800 acres but also for a considerable swath of the surrounding national forest that shares the canyon containing the headwaters of the Middle Fork of the San Joaquin River. Superintendent Dulen believes that the monument will be able to serve in the years ahead as a vital link for species migration as well as a living seed bank.



One of the reasons we know so much about the historic distribution of the mountain yellow-legged frog and its habitat needs was one of the most ambitious scientific explorations ever conducted, the Grinnell Survey. Launched in 1908 and led by field biologist and zoologist Joseph Grinnell, it cruised through a wide swath of California, including a good chunk of **Yosemite National Park**, in an audacious bid to document the state’s natural systems. The survey ran for three decades and created an invaluable ecological database for the Sierra Nevada from the 20,000 specimens collected and the 13,000 pages of field notes. Some of those jottings, made in 1924 by Grinnell himself, noted that the mountain yellow-legged frog was a “common resident

practically throughout the Yosemite region.” But Grinnell also pointed to the decline of the mountain yellow-legged frog and attributed its demise to trout stocking.

Today it’s thought that the frogs inhabit less than 10 percent of their historical distribution, in part because of the trout stocking. But the frog’s future outlook has improved of late. In **Yosemite** and **Sequoia** national parks ecologists have been working in recent years to remove trout from dozens of lakes, and the amphibians are rapidly rebounding. In some instances, lakes that held fewer than 200 frogs in 2001 saw populations explode to 14,000 tadpoles and 3,600 adults three years later after most of the trout were removed.

However, the challenges to the mountain yellow-legged frog are more complicated than simply removing non-native trout from frog habitat. An ongoing concern comes from chemical pollutants, such as fertilizers and pesticides that could be blown from California's Central Valley into ponds and lakes inhabited by the frogs. Frogs possess permeable skins through which environmental pollutants may easily pass. Studies have shown "a strong association" between agricultural pesticides and the disappearance of populations of four species of frogs — including one population of mountain yellow-legged frogs — from historic habitats in California. Additionally, a non-native disease, the chytrid fungus, has been sweeping through parts of the Sierra Nevada and typically is fatal to the frogs.

Climate change is also likely to exert pressure on these already-stressed amphibians both because of direct effects and because it could exacerbate other stressors. Climate change predictions for the region suggest altered precipitation patterns that will lead to less snowpack in the Sierra Nevada, a development that would be dire for the frogs. Less precipitation means already shallow lakes could evaporate and streams dependent on runoff from snowmelt could shrink or perhaps vanish, leaving the amphibians high and dry. The trout make frogs even more vulnerable to shrinking and warming lakes by excluding them from many of the larger lakes that would provide a refuge during dry years. The combined effects of non-native trout and drying lakes pose a severe threat because tadpoles need a year-round water source for their first two to four years to survive, and high egg production depends on above-average snowpack.

SOLUTIONS

Together, all of the factors impacting the mountain yellow-legged frog — less snowpack, earlier runoffs, non-native trout, pollutants, and diseases — pose significant management challenges for the National Park Service as the agency strives to preserve and protect species, ecosystems, and all park resources for the future. Just as we must reduce human-caused threats like non-native trout and pollution, we must limit human-caused warming in order to help preserve lakes and streams the frogs need to survive in Yosemite National Park and throughout the Sierra Nevada.

Developing and implementing plans to help the mountain yellow-legged frog and other species adapt to the effects of climate change and other threats is becoming urgent. Fortunately many of the Grinnell Survey's tracks have been retraced in recent years by crews from the Museum of Vertebrate Zoology at the University of California, Berkeley, in a bid to collect contemporary data on species distributions, habitat, and community composition that can be compared to Grinnell's records. The trick, now, is to use all of this data — that from the Grinnell Survey, recent surveys, and analysis of climate change scenarios — to develop on-the-ground plans that the National Park Service and other land managers can use to guide management of Sierra Nevada species and ecosystems to ensure their survival in the face of climate change.

We Can Safeguard Mountain Yellow-Legged Frogs from Climate Change

Stop contributing to climate change

Mountain yellow-legged frogs could decline even further if we fail to reduce carbon dioxide pollution and global warming that threatens the persistence of mountain lakes and streams that young frogs need to survive.

Reduce and eliminate existing harms that make mountain yellow-legged frogs more vulnerable to climate change

Reducing non-native trout from mountain lakes and streams in the Sierra Nevada, and cutting harmful pollution that originates in the Central Valley, will speed the recovery of mountain yellow-legged frogs and help them cope with new stresses resulting from climate change.

Adopt "climate smart" management practices

Long-term monitoring and research is helping national park scientists begin to understand how climate change interacts with pollution, non-native trout, and other forces that threaten mountain yellow-legged frogs, and this in turn will help them identify and implement strategies that boost the frogs' chance of survival in the face of climate change.