



Boreal Toad

The Boreal Toad (*Anaxyrus boreas boreas*), a subspecies of the western toad, has been listed as an endangered species in the state of Colorado since 1993. Once common in the Southern Rocky Mountains, boreal toad populations and breeding success has declined over the last 30 years in their native habitat and the species is now absent from much of its historic range within Rocky Mountain National Park (RMNP). The Chytrid fungus (*Batrachochytrium dendrobatidis*; Bd), a fungal pathogen which causes a fatal skin disease in amphibians, has been credited as the cause of the recent and rapid declines of boreal toads within RMNP. In September 2017, the U.S. Fish and Wildlife Service (USFWS) determined the eastern population of the boreal toad was not warranted for listing under the Endangered Species Act (ESA) stating that the population is distributed across the majority of its historical range, has a moderate to high resiliency to Bd, and is anticipated to be self-sustaining for the next 50 years. RMNP is a member of the Boreal Toad Recovery Team and has actively worked to improve the status of the Boreal Toad.



Boreal toads can be up to four inches long, from nose to tail. They possess warty skin and often have a distinctive light mid-dorsal stripe. Tadpoles are black or dark brown and eggs are black. Breeding occurs during a two to four-week period from mid-May to mid-June at lower elevations, and as late as mid-July at higher elevations. Boreal toads can migrate several miles from breeding ponds to winter burrows, where they spend the winter in hibernation, but in most cases the distance is much shorter. Eggs are deposited in long, double-layer jelly strings with one to three rows of eggs. Eggs hatch one to two weeks after being laid. Tadpoles typically metamorphose by late July to late August. Recently metamorphosed toadlets aggregate within a few meters of the water, and move into nearby moist habitats later in the summer. Adults often live more than nine years, and their maximum life span is estimated to be about 12 years. Adults forage primarily on ants, beetles, spiders and other invertebrates. Tadpoles filter suspended plant material or feed on bottom detritus.

Communicating to Our Public

Key Messages

- Boreal toads are an indicator of environmental change. They are declining throughout their range—threatened by disease caused by Chytrid fungus, habitat loss, pesticides and other pollutants, climate change, drought, and loss of genetic diversity.
- Research at RMNP has greatly increased knowledge of monitoring techniques and the ability to successfully implement reintroduction efforts.
- RMNP works with agency and academic partners to monitor boreal toads and explore solutions to aid in their recovery.

Desired Action from the Public

- Be aware of challenges facing boreal toads and their conservation; appreciate boreal toad habitats and the species sensitivity to environmental changes.
- Minimize their impact in the park by cleaning boots and/or waders before hiking and fishing in high elevation wetlands, lakes, or streams. Properly disinfect footwear before moving between lakes and drainages.

Background

The boreal toad is Colorado's only alpine toad species, inhabiting lakes, ponds and marshes between 8,500 to 11,500 feet in elevation. Only three other amphibian species (two frogs and the tiger salamander) are present at these elevations in RMNP. The distinct Southern Rocky Mountain boreal toad population is distributed from southern Wyoming to southern Colorado. They primarily occupy slow-moving streams, beaver ponds, small lakes, reservoirs, stock ponds, wet meadows, seeps, creek pools, marshy areas, wet meadows and associated woodlands. Boreal toads need still pools for egg laying and early development; however, adult toads will forage on land both near water and in drier forests.

Boreal toads are very sensitive to environmental changes. They breathe and absorb water through their skin, making them especially susceptible to Chytridiomycosis, a disease caused by *Batrachochytrium dendrobatidis* (Bd; a type of chytrid fungus). Due to their sensitivities, boreal toads can be an indicator of environmental health. Amphibian decline is a significant concern for conservation biologists, who warn that the decline could indicate future and more widespread biodiversity loss. Since amphibians all over the world are facing similar problems, boreal toad research in RMNP helps contribute to a broader library of research and knowledge.

Status, Trends, and Current Research

Amphibian surveys, park records, and field observations (collected since 1915) document boreal toads breeding at 24 sites within RMNP (Corn et al. 1997, park files). In recent years, the number of breeding sites has greatly decreased. During the past 15 years, breeding has only been documented at six sites within the park (Lost Lake, Kettle Tarn, Spruce Lake, Big Meadows, Fay Lakes, and Mount Dickinson). In 2019, evidence of breeding was found at only four of these sites.

Following the guidelines in the Boreal Toad Conservation Plan and Agreement, RMNP started contributing toad stock in 1995 to the captive breeding program at the Colorado Parks and Wildlife (CPW) Native Aquatic Species Restoration Facility (NASRF) in preparation for potential restoration activities. The



NPS/D King



NPS/T Cornwell

A lot of work went into finding appropriate sites for boreal toad reintroductions. Lakes and ponds, such as Cub Lake (top), were evaluated; data was collected on water temperature, pH level, and vegetation type around the water. Chorus frogs were also swabbed to determine presence of Bd. Additionally, when Boulder Brook Ponds was chosen for tadpole release, researchers first released four adults fitted with radio belts (bottom) to further confirm the absence of Bd.

earliest reintroduction attempts took place in 1995 and 1996 and were unsuccessful. In 2007, after a rigorous evaluation of 23 candidate sites, Red Mountain was chosen as the next reintroduction site in the park (NPS 2008). In 2017, Red Mountain reintroduction efforts ceased, but the site is still monitored to determine if the reintroduction was successful. To date, no natural reproduction has been observed at Red Mountain and monitoring will continue for several more years. In 2019, a new reintroduction effort was started at Boulder Brook Ponds near Sprague Lake; 621 tadpoles were introduced to this site on August 9. In 2020, there were five separate reintroductions at this site with over 7,000 tadpoles released. Reintroductions are also planned for 2021 and 2022. In each case, the tadpoles come from eggs collected in the park and surrounding areas and reared in CPW's NASRF. Toad stock from RMNP has

also been used at reintroduction sites in New Mexico. Researchers from RMNP, USGS, Colorado State University (CSU), and the Colorado Natural Heritage Program (CNHP) monitor sites that have had wild breeding in recent years to document breeding success and survival of various life stages of boreal toads and to test for Bd. Additional sites that have not had recent breeding but are historically active are also monitored. The Red Mountain and Boulder Brook Ponds reintroduction sites are monitored carefully to document the progress of reintroduction efforts, with the end goal of establishing successful breeding populations.

Current field survey methods include the capturing, measuring, weighing and photographing of adult toads. Toads are also swabbed and tested for Bd. Some individuals are tagged with a Passive Integrated Transponder (PIT) used for mark-recapture monitoring. Yearlings are counted and estimated. Disinfection guidelines are followed when performing the toad fieldwork to prevent the spread of disease. Eggs are collected from breeding sites and transported to the



Boreal toad breeding sites are monitored each year to document evidence of breeding, estimate the size of egg masses, note the stages of metamorphs present, measure and weigh adult toads, and swab adults for Bd.

hatchery to be reared to tadpoles and reintroduced. The number of tadpoles released and the stage of development is recorded during each reintroduction.

In 2018, soil studies taken near toad breeding sites looked at the presence of the probiotic *Janthinobacterium lividum*. The probiotic was present in

Summary of 2019 Monitoring



Big Meadows: No toads or evidence of breeding was found on three of different surveys. No egg masses, tadpoles, or breeding activity was observed in 2019.

Fay Lakes: Breeding was documented with one pair of toads observed in amplexus and an associated egg mass. An estimate of 4,000 eggs were observed and 1,000 transported to the NASRF hatchery in Alamosa, CO for the reintroduction effort at Boulder Brook ponds. Tadpoles and metamorphs were not confirmed later in the season and it is unclear if any tadpoles survived.

Kettle Tarn: Two new male toads were found on two surveys and were recaptured on subsequent surveys. These were the only toads found throughout the season and there was no evidence of breeding.

Lost Lake: Two new females, 4 new males and one recaptured male were observed during the field season. There was evidence of breeding with tadpoles observed on August 15.

Mt. Dickinson: Two male toads were observed in 2019. Tadpoles were observed at low numbers (<500).

Spruce Lake: At least 2 male and 2 female individual toads were found. Two egg masses were found and portions were collected and taken to the Alamosa hatchery. These eggs were reared to tadpoles and reintroduced in New Mexico.

Red Mountain: No toads were located at any life stage.

four of the five sites tested. Soil augmentation with this and other naturally occurring and beneficial bacteria may have future conservation applications to improve infection outcomes for Bd infected toads.

Management

One of RMNP's greatest strengths regarding boreal toad conservation is our collaboration with university, state and federal cooperators. Our relationship with Erin Muths (USGS) and Larissa Bailey (CSU) continues to move our program forward by implementing credible scientific monitoring. The park has benefited through increased mark-recapture monitoring at many of our populations. In 2019, a new partnership was formed with the CNHP to assist in monitoring our boreal toad breeding sites. CPW continues to be an active partner for egg collection and hatchery rearing of tadpoles for reintroduction.

RMNP is a member of the interagency Boreal Toad Recovery Team. The Team produced the Boreal Toad Conservation Plan and Agreement that addresses specific

guidelines for collection of toads, toad transport, captive-rearing, reintroduction, pre-restoration surveying, and post-restoration monitoring (Loeffler 2001). RMNP is following guidelines outlined in this plan for any actions taken related to boreal toads. In addition, the Environmental Assessment *Removal of Some Boreal Toads from Rocky Mountain National Park for Placement into a Captive Breeding Program* (2000) is used as a guiding document. Actions at all sites are approved in accordance with the project clearance proposal process.

Looking to the future, RMNP and its partners will continue to survey boreal toad breeding sites and collect eggs for the hatchery for rearing until they are large tadpoles ready for reintroduction. Whether or not reintroduction efforts will result in viable populations remains to be seen, but ongoing monitoring and adaptive management practices are in place to improve the chances of success.



NPS/T. Cornwell

May people were involved in making the 2019 toad release at Boulder Brook a success. This effort would not have been possible without the commitment of partners.

Resources and References

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