

# Restoring Colorado Wetlands to Benefit Native Amphibians

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## Objectives:

1. To determine whether Colorado golf courses (representative of habitats in suburban landscapes) are currently supporting invasive American Bullfrogs (*Lithobates* (= *Rana*) *catesbeiana*).
2. To determine whether invasive bullfrogs are serving as reservoir hosts for a fungal pathogen that is harmful to native amphibians.
3. To test a method of mitigating bullfrog populations by drying down ponds off-season and interrupting larval bullfrog development.

**Start Date:** 2009

**Project Duration:** two years

**Total Funding:** \$60,000

American Bullfrogs (*Lithobates* (= *Rana*) *catesbeiana*) are invasive in the western US, including Colorado, and present several threats to native amphibian diversity. Bullfrogs are aggressive predators and competitors of many native western amphibians, and they are thought to have the potential to act as a reservoir host for a harmful fungal amphibian pathogen (*Batrachochytrium dendrobatidis*, referred to as Bd).

Along the Front Range region of Colorado, east of the Rocky Mountains, bullfrog populations have expanded at the same time that the area has undergone rapid human development. We believe that bullfrogs are responding to this land use change by taking advantage of the artificially permanent water bodies that accompany suburbanization. Unlike our native amphibians, bullfrogs require permanent bodies of water to have successful development because their tadpole stage lasts more than a year.

In the western US, agricultural expansion followed by urbanization has led to the creation of many artificial but permanent ponds (e.g. cattle ponds and suburban ponds) where they had not previously existed. In this same region, native leopard frogs have undergone drastic declines in recent decades that coincide with land use change, invasive bullfrog expansion, and the appearance of the amphibian pathogen, Bd. Therefore, learning about the regionally specific biology of invasive bullfrogs is key to understanding how we may mitigate their negative effects on vulnerable native species.

We are examining the hypothesis that bullfrogs are a reservoir host for Bd, meaning that they carry and spread the pathogen without experiencing disease.



Valerie McKenzie and Elise Breed gather data on bullfrogs at Flatirons Golf Course in Boulder, Colorado.

And finally, we are exploring a method of reducing bullfrog breeding by conducting dry-downs of bullfrog breeding ponds during the off-season, thereby breaking their larval development cycle.

During the summer of 2009, we conducted our first field season on golf courses in the Colorado Front Range. In total, we surveyed 95 ponds from 21 different golf courses located between Fort Collins and South Denver. Of the 95 ponds surveyed, we found invasive bullfrogs present at 38 ponds (40%) with active breeding at 24 ponds (25%). This is a major success because we have confirmed our prediction that golf courses would provide a good opportunity to study the distribution of this invasive species.

Golf courses are located in suburban landscapes and often use municipal water sources (e.g., channelized ditch canals) to fill their ponds. We believe that bullfrogs are using these canal systems as a pathway for dispersal and the artificial ponds (such as those on golf courses) as a place for breeding. We found native amphibians at only a handful of ponds (4%), and these included a few chorus frog

and western toad tadpoles.

Overall, native amphibians were very rare. Of the 38 ponds where we observed bullfrog populations, 35% of them were found to be positive for Bd. This result is a strong indicator that bullfrogs do serve as reservoir hosts for this harmful amphibian pathogen and lends further support to our argument that bullfrog mitigation is needed.

## Summary Points

- Invasive bullfrogs threaten native amphibian diversity in Colorado.
- Invasive bullfrogs are very common on golf courses in Colorado as a result of municipal water sources that support their dispersal and breeding.
- Of the 38 bullfrog populations surveyed on golf courses, 35% were positive for a fungal amphibian pathogen (Bd), indicating that bullfrogs are an increased threat due to their role as a pathogen reservoir.
- Mitigating bullfrog breeding sites by conducting temporary dry-downs of golf course ponds will be the focus of the upcoming year's activities.