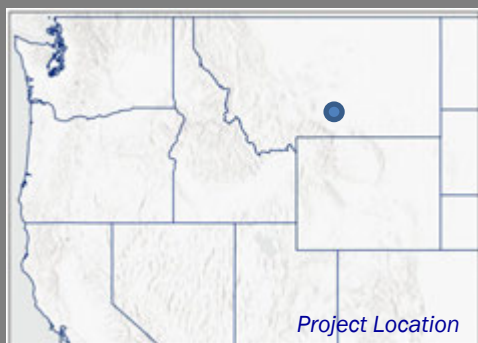


ACTIONABLE SCIENCE

Researching Bullfrog Establishment Pathways and Control Techniques in the Yellowstone River, Montana



American bullfrogs, native to eastern North America, are highly successful invaders to aquatic systems across the globe, including in the western United States. Once established, bullfrogs can negatively impact native aquatic communities. In 1999, bullfrogs were first observed in the Yellowstone River near Billings, Montana. Due to concerns of potential negative effects, scientists from the United States Geological Survey (USGS) Northern Rocky Mountain Science Center initiated research in 2010 on ecological factors that enable bullfrogs to spread in the Yellowstone River and tested different removal methods to inform future bullfrog control options.



American Bullfrog from the Yellowstone River, Montana/USGS

KEY ISSUES ADDRESSED

Non-native bullfrogs (*Rana catesbeiana* or *Lithobates catesbianus*) have the potential to readily disperse across the landscape, have high fecundity, carry chytrid disease, and they can be voracious predators of native reptiles, amphibians, fishes, and even birds. Bullfrogs have been documented to eliminate native species through competition and direct predation in diverse environments in the western U.S., ranging from warm, water-limited landscapes in southern Arizona as well as wet environments in California or western Oregon. Ecological impacts of bullfrog colonization, however, are not as well understood in the Yellowstone River watershed, where water is persistent for much of the year.

PROJECT GOALS

- Take inventory of non-native bullfrogs with presence/absence surveys in the Yellowstone River near Billings, Montana
- Document environmental conditions in locations with known bullfrog populations
- Track the spread of bullfrogs and their impacts on native species
- Test bullfrog suppression methods to identify effective control strategies



HABITAT DRIVERS

A modeling approach revealed that water depth and emergent vegetation best predicted bullfrog breeding at surveyed sites, while water depth and public site access best predicted bullfrog occurrence at any life stage.

LESSONS LEARNED

While non-native aquatics management in undammed rivers often focuses on restoring natural flows, for undammed rivers like the Yellowstone, maintaining natural flow variation may be a tool to complement direct removal efforts for controlling (or at least containing) non-native species like bullfrogs.

Bullfrogs were often present in human-modified habitats like side channels, canals, artificial ponds, and other publicly accessible sites. Increasing public outreach and education could be an effective method to prevent future spread and support control efforts for bullfrogs. Yet, bullfrogs are difficult to control in large systems like the Yellowstone River due to habitat complexity, dynamic flow regimes, and difficulty accessing remote field sites.

The project team found that close proximity of a site to a permanent, off-channel water source (e.g. gravel quarries and municipal ponds adjacent to but not in the river channel) promoted bullfrog presence.

NEXT STEPS

- Prioritize future management with limited funding
- Apply control efforts during bullfrog population boom and bust cycles
- Focus on long-term bullfrog eradication actions
- Use novel tools like population genetics and eDNA to better understand bullfrog dispersal

PROJECT HIGHLIGHTS

Systematic Surveys: Montana Natural Heritage Program initially conducted visual encounter surveys (VES) and calling surveys at 34 sites in 2010 and the later project team expanded to over 100 sites by 2013. Surveys in 2012-2013 also included habitat measurements such as water temperature, water depth, vegetation cover, and dissolved oxygen.

Detecting Spread: Evidence for bullfrog breeding (presence of egg masses or tadpoles) was initially found in 12 sites in 2010. In 2013, over 58 sites contained breeding evidence along 107 km of floodplain habitat, both upstream and downstream of the initial bullfrog detections near Billings.

Bullfrog Removal Techniques: Multiple field techniques were used to remove bullfrogs at various life stages from sites identified with bullfrog breeding. These included seine netting, hand netting, pellet guns, dewatering, and backpack electrofishing.

Collaborators

- U.S. Geological Survey, Northern Rocky Mountain Science Center
- U.S. Bureau of Land Management
- Montana Natural Heritage Program
- Montana Fish, Wildlife & Parks
- Montana Audubon Center

Funding Partners

- See online Case Study for list of funding partners

PROJECT RESOURCES

For more information on this project, contact Adam Sepulveda: asepulveda@usgs.gov

For additional project resources and Case Studies, scan the QR code below or visit the CCAST website:

WWW.DESERTLCC.ORG/RESOURCE/CCAST



Radio-Tagged Bullfrog

Lead Author: Alex Koeberle, University of Arizona, June 2020.
Case Study support by US Fish and Wildlife Service and US Bureau of Reclamation
Photos courtesy of Adam Sepulveda/USGS

