

Pacific Southwest Research Station

Sierra Nevada Research Center

Reintroduction of declining amphibians: a case study for the foothill yellow-legged frog (*Rana boylei*) and development of a quantitative database.

The Research:

Species reintroductions provide a model for integrating practical and theoretical aspects of conservation biology. However, we currently lack a clear understanding of the factors that determine the outcome of reintroduction programs for many taxa. Combining pre-reintroduction research on ecology, genetics, and causative factors of declines with experimental reintroductions and rigorous monitoring, offers an approach that should increase reintroduction success rates. Amphibians present challenges as reintroduction subjects due to characteristics such as biphasic life cycles, low mobility, and patchy distributions.

The foothill yellow-legged frog historically occurred in foothill and mountain streams from northern Baja California to southern Oregon west of the Sierra-Cascade crest, to 1830m (6000 ft) in elevation. This species has experienced significant population declines especially in the southern part of its range (southern Sierra Nevada and south coastal California) and is currently listed as a California State Species of Special Concern and USDA Forest Service California Region Sensitive Species. In the Sierra Nevada, it apparently has disappeared from at least 66% of its historic range.

This project uses the foothill yellow-legged frog (*Rana boylei*) as a focal species to assess the ecological feasibility of a reintroduction. Three factors, that likely play a role in success of species reintroductions, are described and assessed in detail for this species: (1) pattern of and factors in its decline, (2) genetic variation and phylogeographic structure, and (3) habitat associations and suitability. The pattern and factors in decline are being analyzed using G.I.S. and will provide insights into potential locations for reintroduction. Genetic analyses are being done at the scale of the entire range of the species and for selected river basins, and both provide context for understanding genetic structure at the smaller scales. Habitat associations' analyses are being conducted for large and small populations throughout the Coast Ranges and Sierra Nevada to determine key habitat features needed at target reintroduction sites.

As second component of this project is the development of an amphibian reintroduction database. We are building a relational database for amphibians based on one developed for birds - the Avian Reintroduction Database (ARD) (Earnhardt, J.M, D. Rentsch, E. VanderWerf, L. Faust, A. Wolf, and S.D. Thompson. 2003. The science of reintroduction: A survey of avian release programs. Poster presentation at Society for Conservation Biology Annual Meeting, Duluth, MN., July; Available upon request from JEarnhardt@lpzoo.org). The ARD contains over 80 variables for each species and release event. To date, we have evaluated the avian database relative to its appropriateness for amphibians and documented the modifications needed. We have also developed a summary table of amphibian reintroduction programs in North and Central America which can be found on the Declining Amphibian Populations Task Force web site (<http://www.open.ac.uk/daptf/about/abou7.htm>).



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Our Mission:

Sierra Nevada Ecosystems are complex and our knowledge of them is incomplete. As a result, the long term outcome of any given land and resource management strategy is uncertain. We will provide assistance to land managers and policy makers by addressing this management dilemma through targeted research, emphasizing an integrated, ecoregional approach to examine particular physical, ecological, and socio-economic issues, across a range of appropriate spatial and temporal scales specific to each issue.

This unit will represent the collective research expertise and interests of scientists located in Fresno, Davis and Albany as well as other scientists within the Pacific Southwest Research Station. With a full spectrum of research, from long term, fundamental research to short-term, tactical applications, this Center is intended to support conservation, restoration, and sustainable utilization of the lands within the Sierra Nevada ecoregion.



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For further information contact:
Amy Lind, Ecologist
530-759-1702

Peter Stine, SNRC Program
Manager

Objectives:

- Determine the primary causes of decline of the foothill yellow-legged through examination of species distribution (locality) data and corresponding spatial information on known and potential threats.
- Describe the genetic variation and structure of the foothill yellow-legged frog throughout its range and determine appropriate applications of this information to the conservation of the species, specifically with regard to the potential for reintroductions in areas of decline.
- Quantify habitat associations of the foothill yellow-legged frog and identify features of potential reintroduction sites based on habitat suitability for all life stages of the species.
- Develop a conceptual model for species reintroduction planning with considerations for: (a) source populations, (b) identification of areas where decline factors can be reduced or eliminated, (c) minimizing risk of negative affects on gene flow regimes, and (d) local habitat suitability.
- Develop a database of amphibian reintroduction projects to aid in coordination, planning and evaluation of these efforts.

Application of Research Results:

Results from the case study on foothill yellow-legged frogs have direct and immediate application in the conservation of this species and in land/water management planning. In addition, these results make a substantial contribution to basic knowledge of the ecology and genetics of this species. The amphibian reintroduction database can be used by both restoration practitioners searching for current information, contacts, methodologies, and by scientists interested in evaluating programs with regard to species, geographic regions, and other factors.

Location:

Varies depending on objective. Analysis of decline factors and general genetic analysis will occur throughout the range of the species (southwestern Oregon and California, west of the Sierra-Cascade Crest). Local scale genetic analysis and habitat suitability will be focused on the Sierra Nevada foothills, especially the southern Sierra Nevada and adjacent populations to the north and west (inner Coast Ranges).



Photo: Laura Conway

www.fs.fed.us/psw/programs/snrc

Albany Location:
800 Buchanan Street
Albany, CA 94710

Mailing Address:
P.O. Box 245
Berkeley, CA 94701
Phone: 510-559-6300
Fax: 510-559-6440

Davis Location:
2121 Second Street
Suite A101
Davis, CA 95616

Phone: 530-759-1700
Fax: 530-747-0241

Fresno Location:
2081 E. Sierra Avenue
Fresno, CA 93710

Phone: 559-323-3200
Fax: 559-297-3355