Restoration of Native Species in High Elevation Aquatic Ecosystems

Planning Participant Workbook

Message from the Superintendent

Dear Friends,

One of my favorite memories of the High Sierra lakes is sitting quietly after a long summer hike and listening to the frogs talk on the shoreline of a calm and glassy lake.

Sadly, for many high elevation lakes, that is only a memory. Many people will travel that same trail a mere twenty years later without ever seeing a frog. Non-native fish, planted as recently as the 1970s, have fed voraciously on tadpoles, depleting frog populations almost to the point of extinction.

And the impact is more than aesthetic. As frogs occupy the center of the food chain, acting both as predators and prey, their absence skews the entire food chain, affecting everything from macro invertebrates to large mammals, like coyotes.

Many factors affect our wild areas, and the more pristine the setting, the more keenly we feel it when conditions change. As land managers, we have an obligation to work to mitigate those factors to the extent that we can. Removing non-native trout from up to 15% of our waterways over the next 30 years can help restore healthy, vibrant populations of yellow legged frogs-- giving the species a fighting chance at surviving global factors like pollution and climate change - while keeping ample trout available for recreational fishing.

For the past two years, staff at Sequoia and Kings Canyon National Parks have been designing a plan that helps restore these native species in high elevation ecosystems. Subject matter experts from inside and outside the National Park Service have evaluated possible tools, best practices, and public comment to come up with alternatives which best meet ecosystem management objectives. We invite you to help us evaluate these alternatives to help ensure that no reasonable concept is overlooked as we move towards drafting an Environmental Impact Statement.

Thanks for your interest, and for sharing in this legacy. With your help we will be able to restore these diverse ecosystems and preserve the recreational opportunities that are found there.

Sincerely,

Karen Taylor-Goodrich
Superintendent

Contact us!

If you would like to be on the mailing list for this project, please provide your name and mailing address, or your email address to: Superintendent, Attention: Restoration of High Elevation Aquatic Ecosystems, 47050 Generals Highway, Three Rivers, CA 93271, or by email to seki_planning@nps.gov

To submit comments on park projects, please visit the Planning, Environment and Public Comment (PEPC) website at http://parkplanning.nps.gov/ and select Sequoia and Kings Canyon NP for a list of all park projects.

Draft Purpose of and Need for Action

The purpose of this Restoration of Native Species in High Elevation Aquatic Ecosystems Plan and Draft Environmental Impact Statement (DEIS) for Sequoia and Kings Canyon National Parks (parks) is to guide management actions by the National Park Service (NPS) to restore and conserve native species diversity and ecological function to selected high elevation aquatic ecosystems that have been adversely impacted by human activities. This plan/EIS would be implemented over a period of approximately 25-30 years, with re-evaluation every 5-10 years.

This project is needed because the natural abundances and distributions of native species are being adversely impacted, primarily by the presence of introduced non-native species, resulting in losses of biological diversity and ecological function in high elevation aquatic systems.

One example of adverse impact is the extinction of native mountain yellow-legged frogs (MYLF) from 92% of historic localities in the Sierra Nevada including the parks. Researchers have identified two primary factors for the drastic decline of MYLFs: 1) the presence of non-native trout that prey on the frogs, compete with them for food, restrict their breeding to marginal, shallow habitat, and fragment remaining populations; and 2) the recent spread of chytrid fungus that has infected most remaining MYLF populations and caused them to severely decline. In addition, air pollution has been implicated in amphibian declines by depositing contaminants into aquatic habitat, which may make frogs more susceptible to disease. Lastly, global climate change has been implicated in drying up critical breeding habitat in one MYLF population, and may have more impact in the future. NPS Management Policies 2006 directs parks to implement feasible management actions to respond to resource threats. Regional air pollution and global climate change are outside the control of park management. Chytrid fungus is not well understood despite several recent studies, but current studies will hopefully provide future tools to mitigate its effect on amphibians. Managing non-native trout populations, however, is mostly within the control of park management. Given their widespread impact on high elevation aquatic ecosystems, it is imperative to remove trout from selected waters to facilitate recovery of native species and conserve them for future generations.

In 2001, the parks began eradicating non-native trout from high elevation lakes and adjacent streams to assess the feasibility of restoring aquatic habitat for native species using gill-nets and electrofishers. By 2009, trout were fully or nearly eradicated from 11 lakes, and MYLFs in nine of these lakes remained disease-free three years after trout removal. During this time, average tadpole density in these nine lakes increased by 13-fold (from 2.4 to 30.8 per 100 feet of shoreline), while average frog density increased by 15-fold (from 2.4 to 35.4 per 100 feet of shoreline). Several of these MYLF populations are now among the largest in the Sierra Nevada. In addition, average mountain garter snake abundance in these nine lakes increased by 7-fold after trout removal (from 0.07 to 0.48 counted per survey). These results show that eradicating non-native trout is feasible, and highly beneficial to MYLFs and native species.

Under the DEIS, the NPS will explore options for eradicating additional trout populations across these parks for the purpose of helping existing native populations become as resilient as possible to uncertain future conditions.

Note: Literature references will be shown in the Draft EIS

Please use this space for thoughts, questions, and observations

Draft Objectives

Objectives are specific statements of purpose that describe the desired outcomes a management alternative must largely achieve for the proposed restoration to be considered a success. As the ability to achieve objectives is part of what defines an alternative as reasonable, objectives also provide critical boundaries for action.

The following draft management objectives were developed for the restoration plan:

- Restore and conserve the natural abundances, distributions and functions of native species, populations and communities within high elevation aquatic ecosystems by implementing management actions to create more favorable conditions for these populations to persist and be more resilient to future conditions.
- Eradicate a non-native, invasive, predator and competitor (introduced trout) from up to approximately 75 of these parks' 560 fish-containing lakes and ponds. One indicator that would be measured is the status of amphibians and reptiles in restoration habitats.
- Prevent widespread loss of ecological function provided by mountain yellow-legged frogs and conserve their genetic diversity and geographic distribution by emphasizing restoration and protection of existing populations within their historic range. Use the best-available scientific methods to expand population abundance and distribution, where feasible, and to re-establish populations that have recently gone extinct.
- Prioritize and facilitate research to inform understanding of naturally functioning high elevation aquatic ecosystems and to apply science-based restoration and conservation at multiple spatial scales including landscape, watershed, basin, and individual lake.
- Use results from restoration efforts and new data from research studies to refine program methodologies over time and mitigate impacts that have the potential to occur during restoration.
- Collaborate with partner agencies and organizations to exchange information, enhance use of available resources, and strategically restore and conserve native species, including mountain yellow-legged frogs across their historic range in the Sierra Nevada.
- Implement this plan using an appropriate range of management responses derived from a thorough analysis of potential effects to wilderness character and resources.
- Provide an appropriate range of visitor experiences and recreational opportunities at wilderness lakes and streams concurrent with minimizing impacts to the biological integrity of high elevation aquatic ecosystems.
- Use education to increase park staff, visitor, partner, and stakeholder awareness of internal and external threats to high elevation aquatic ecosystems, and associated management responses to restore these systems, including but not limited to removal of targeted non-native species that are causing adverse impacts.

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Table of Proposed Conceptual Alternatives at a Glance

For more information, see Draft Conceptual Alternatives Document

Alternative A - No action, no new lakes/basins restored

Alternative B - Prescription treatment preceding restoration, approximately 25 to 28 new basins restored

- Non-native trout eradicated from ~73 water bodies in 20 basins
- Native species conserved in or restored to currently fishless waters in up to 28 basins
- Eradication sites represent ~13% of the parks' ~560 lakes, ponds, and wetlands known to contain fish
- ~485 self-sustaining fishing waters would remain
- Treatment would include trout eradication by gill netting and electrofishing at all sites where feasible
- And using piscicides at sites determined in-feasible for other treatment methods

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Alternative C - Physical treatment preceding restoration, approximately 22 to 25 new basins restored

- Non-native trout eradicated from ~32 water bodies in 15 basins
- Native species conserved in or restored to currently fishless waters in up to 25 basins
- Eradication sites represent ~6% of the parks' ~560 lakes, ponds, and wetlands known to contain fish
- ~525 self-sustaining fishing waters would remain
- Treatment would include trout eradication by gill netting and electrofishing at all sites where feasible

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Alternative D - Chemical treatment preceding restoration, approximately 25 to 28 new basins restored

- Non-native trout eradicated from ~73 water bodies in 20 basins
- Native species conserved in or restored to currently fishless waters in up
- Eradication sites represent ~13% of the parks' ~560 lakes, ponds, and wetlands known to contain fish
- ~485 self-sustaining fishing waters would remain
- Treatment would include trout eradication using piscicides

Draft Criteria for Basin Selection

Favorability Factors	Rule-out or Red-flag Factors
Elevation is above 6,000 feet.	Rule-out: Elevation is below 6,000 feet (Lake basins in SEKI do not occur below this elevation).
Within natural distribution of mountain yellow-legged frogs (evidence of current or recent populations; includes sites where frogs recently died out due to disease).	Red-flag: There is no evidence of current or past mountain yellow-legged frog populations (removal of trout would still benefit other native species).
Conserves genetic diversity of mountain yellow-legged frogs within SEKI (several sites restored within each of three major genetic groups).	Red-flag: Total number of restoration sites is imbalanced with respect to genetic diversity of mountain yellow-legged frogs within SEKI.
Conserves spatial representation of mountain yellow-legged frogs within SEKI (sites restored across park latitudes and longitudes).	Red-flag: Total number of restoration sites is imbalanced with respect to spatial representation of mountain yellow-legged frogs within SEKI.
Groupings of waterways appropriate for treatment: In basins in which some fish lakes would remain, the restoration lakes would need to be at top of basin. Several entire basins are restored, spread across SEKI.	Red-flag: Groups of waterways not considered appropriate for treatment would include basins in which some fish lakes would remain and the restoration lakes would be at middle or bottom of basin.
Adequate downstream barrier (large waterfall or long, steep cascade) exists to prevent fish from recolonizing restoration area. Barrier adequacy would be assessed prior to onset of restoration.	Rule-out: No adequate downstream barrier exists. Fish are observed breaching all possible barriers.
Restoration is feasible from a logistical standpoint. Habitat structure would allow trout eradication without extreme difficulty, and site is accessible by field crews.	Rule-out: Restoration is considered infeasible from a logistical standpoint. Habitat structure is so complex that it would be extremely difficult to eradicate trout, and/or site cannot be safely accessed by field crews.
For individual lake selection, recreational fishing value of lake is considered to be medium to low (not an extremely popular or trophy fishery). For the overall project, fishing opportunities within SEKI continue to exist that satisfy a range of visitor values, including multiple lakes: 1) near trailheads for easy access 2) in remote basins for solitude 3) having large fish for a trophy experience 4) having fish for a high-catch experience	Red-flag: For individual lake selection, recreational fishing value of lake is considered to be high (an extremely popular or trophy fishery). For the overall project, multiple fish lakes within each of the following categories do not continue to exist within SEKI: 1) near trailheads for easy access 2) in remote basins for solitude 3) having large fish for a trophy experience 4) having fish for a high-catch experience
Crew presence would not adversely affect threatened or endangered plants or wildlife.	Red-flag: Crew presence would adversely affect threatened or endangered plants or wildlife.
Other known threats are not an issue.	Red-flag: Other threats make site less desirable. For example, considering piscicide use in areas close to human populations.

Please use this space for thoughts, questions, and observations

Planning Timeline

Anticipated Schedule & Next Steps

November 21, 2009	Second scoping period ended
December	Comments analyzed
December-March	Draft conceptual alternatives devloped
March – April 2010	Public alternatives workshops
Summer/Fall 2010	60-day public review of Draft Environmental Impact Statement (EIS)
Fall/Winter 2010	Analyze comments and prepare Final EIS
Winter 2010 /Spring 2011	Public distribution of Final EIS
Spring/Summer 2011	Select final alternative and notify public of decision

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