National Park Service
U.S. Department of the Interior

Yellowstone National Park
Idaho, Montana, Wyoming

NATIVE FISH CONSERVATION PLAN FINDING OF NO SIGNIFICANT IMPACT

BACKGROUND

Across Yellowstone National Park, the pristine streams, rivers and lakes were once home to an abundance of native Yellowstone cutthroat trout (YCT), westslope cutthroat trout (WCT), and river-dwelling (fluvial) Arctic grayling (GRY). These unique fish were a historically significant component of the park's native fauna and they are highly valued ecologically, economically, and socially in the Greater Yellowstone Area. Now, largely due to the introduction of non-native trout to the park and changes in land/water use nearby, fluvial GRY are gone from park waters and WCT exist in only a few small, isolated locations.

Yellowstone Lake is isolated from threats of nonnative fish downstream by the falls on the Yellowstone River (at Canyon) in the parks interior. Until the late 1980s, Yellowstone Lake supported the largest population of YCT in the region. This population underpinned the natural food web of the Yellowstone Lake ecosystem, has great economic significance, provides unparalleled visitor experiences, and defined much of the 20th century historic context of Yellowstone National Park. Nonnative lake trout (LKT), which are highly efficient, long-lived fish predators, were illegally introduced to Yellowstone Lake in the late 1980s. As a result, the YCT have since largely vanished, primarily due to predation by the introduced LKT. Use of the lake ecosystem by animals which are dependant on YCT as a food source, such as eagles, ospreys, river otters, and grizzly bears, has been greatly altered as a result.

In compliance with the National Environmental Policy Act, the National Park Service (NPS) prepared a Native Fish Conservation Plan / Environmental Assessment (EA) to examine various alternatives and environmental impacts for the conservation of native fish in Yellowstone National Park. The EA provides guidance and an adaptive management framework for making decisions regarding fisheries and aquatic resources conservation over the coming decades.

The preferred alternative of the EA was selected after a careful review of resource and visitor impacts and public comment. Concerns identified during scoping and evaluated in the EA included large-scale suppression of LKT on Yellowstone Lake, disposition of LKT carcasses, use of fish toxins (piscicides), and program/project emphasis areas.

This document records 1) a Finding of No Significant Impact as required by the National Environmental Policy Act of 1969 and 2) a determination of no impairment as required by the NPS Organic Act of 1916.

SELECTION OF THE PREFERRED ALTERNATIVE

The preferred alternative identified in the EA is Alternative 2 (Preferred Alternative): Full Use of Native Fish Conservation Techniques and LKT Carcasses Returned to Yellowstone Lake. This FONSI adopts Alternative 2. Clarification of the parks intent to include all native fish, not just native sport fish; and to conduct breeding surveys for amphibians; are included within the Errata Sheets of this FONSI. This FONSI adopts all procedures, constraints, guidelines, criteria and mitigating measures established in the EA.

The following describes the Preferred Alternative and includes a description of the modifications to this alternative. The specific changes to the text of the EA are listed in the Errata Sheets attached to this FONSI.

Yellowstone Lake Ecosystem

Restoration of Yellowstone cutthroat trout on Yellowstone Lake is the highest native fish conservation priority for Yellowstone National Park. As such, NPS will implement large-scale suppression of LKT on Yellowstone Lake using NPS fisheries staff and private sector contract netters.

Given the need to (first) greatly reduce the abundance of LKT on Yellowstone Lake, and then to maintain the population at a greatly reduced level, it is anticipated that the heightened NPS and contract netting efforts will be implemented for at least 5-6 years, to allow sufficient time for YCT recovery to begin. Suppression efforts will need to be continued beyond 5-6 years at a level of effort sufficient to keep LKT abundance low, and allow for the recovery of YCT abundance and population size/age structure and achieve the desired condition on Yellowstone Lake.

Using an adaptive management strategy, NPS will strive to meet (scientifically-derived) lake trout mortality benchmarks necessary to achieve the most desired condition possible on Yellowstone Lake, given best available technologies and adequate resources. Suppression efforts will occur through a majority of the open water (ice free) season using gillnets (primarily) and large deep-water trapnets set/retrieved from large (>30 ft) watercraft. Lake trout will be netted and killed and the carcasses will be returned to Yellowstone Lake.

Lake trout suppression efforts will vary within and among years depending upon project success. Greatly improving lake trout suppression efficiency will be critical for ensuring the long-term viability of the Yellowstone Lake effort. NPS will continue science panel review evaluations (by USGS and/or other partners) to ensure appropriate direction and ultimate effectiveness.

NPS will continue to collaborate with partners to seek funding and lead critical research efforts. As technologies to more efficiently suppress lake trout are identified, NPS will incorporate them into efforts on Yellowstone Lake. New methods may include the use of electrical shock and piscicide to kill lake trout embryos on spawning areas. Other critical research to be conducted includes sonic (acoustic) tagging of lake trout so the movements

of individual fish can be monitored throughout the year and precise locations of spawning areas can be targeted.

As a climate change adaptation strategy, all known YCT spawning tributaries will be checked repeatedly throughout the season, especially late July through September, to ensure surface water connections with the lake are maintained. If young YCT are stranded in tributary streams that become disconnected from Yellowstone Lake, the gravel will be removed so that flows from the tributary are reconnected to the lake with surface depths of at least one inch to allow previously stranded juveniles to emigrate to the lake.

If population monitoring (as described below) suggests that the LKT population has been sufficiently reduced to allow YCT recovery but the YCT population does not sufficiently respond, YCT will be reintroduced to tributary streams where it has been demonstrated that the natural YCT spawning population has been lost. The YCT will be introduced into tributaries as advanced embryos (eyed eggs) using remote site incubators (RSIs) placed directly into flowing waters during the spring.

Identifying specific quantitative responses will be crucial to the success of the adaptive management strategy for the Yellowstone Lake ecosystem. All of the desired conditions and conservation actions include performance metrics that are tied to the LKT population response and the resulting YCT population response. These metrics will be used to assess the success or failure of this important aspect of the Native Trout Conservation Plan.

To assess the status of the Yellowstone Lake LKT and YCT populations, each August the NPS will conduct distribution netting at randomly selected sites located throughout Yellowstone Lake. Monofilament gillnets will be set overnight on the lake bottom at depths ranging from shallow (5 m) to deep (50 m). Fish will be removed and returned to the laboratory for processing, including weighing, measuring, assessing condition, and removing biological samples such as scales and otoliths (ear bones). All LKT and YCT carcasses will be fully examined for biological characteristics (e.g., age, growth, reproductive status) and health (e.g., presence of whirling disease or other pathogens). In addition, the lakewide population of LKT and YCT will be annually monitored via catches by anglers as reported on the returned Volunteer Angler Report survey cards.

Clear Creek, a large tributary along the lake's eastern shore, has been used to assess the abundance, condition, sex ratio, and age and length structure of spawning YCT since 1945 through capture at a weir and trap from May to July each year. However, high spring flows damaged the structure in 2008, making the weir and trap unusable. The NPS will rebuild the Clear Creek weir at the original site, using the bulkheads from the previous weir and mostly unnatural materials, including concrete blocks, cement, steel, and iron. The structure will be able to withstand high spring flows with as little impact to stream hydrology as possible and permit the visual counting, capture, and handling of YCT as they ascend the creek to spawn. The NPS will monitor the YCT spawning population using the new weir and trap at Clear Creek and by continuing visual surveys of 11 small frontcountry tributaries in the Grant and Lake areas.

Other Streams, Rivers, and Lakes

The conservation of native fish in streams, rivers, and lakes other than Yellowstone Lake will focus on the restoration of WCT, YCT and GRY populations across the park. This approach will emphasize projects that maximize conservation value, efficient use of resources, and likelihood of success. Projects and their desired outcomes will vary on a case by case basis largely depending on existing conditions, technical limitations, consideration of ecological, socioeconomic, and other impacts, and available resources. No impacts will exceed those disclosed in the environmental assessment.

All conditions will be evaluated in an adaptive management framework that specifies conservation actions, defines success in terms of quantitative responses and performance metrics, and identifies alternatives to be considered if conservation actions do not produce a desired result. Desired conditions are for specific waters (project areas) within Yellowstone National Park.

For projects where they are deemed necessary, fish barriers will be located in the most downstream location suitable for construction in order to provide the largest possible area upstream for native fish restoration. The barriers proposed will be designed to completely preclude all upstream fish movement and ensure structural integrity and function across a wide range of water flows, including a 100-year flood event. Structures will be at least 1.8 m (6 ft) in height with a vertical or near vertical drop onto an engineered hard flat surface or splash pad to prevent a plunge pool from forming at the base of the barrier.

Barriers to upstream fish movement will also be created by modifying existing natural features, usually cascades, into complete barriers, by redirecting stream flow using wing walls, filling plunge pools with material to eliminate jumping areas, using explosives to increase the height or angle of a feature, or some combination of these techniques.

Construction or modification of barriers will require the NPS to complete site-specific surveys for all potentially impacted natural and cultural resources and obtain all applicable state and federal permits. This surveying and permitting will be completed on a case by case basis before construction activities commence. Overall, the construction of fish barriers will be done with the utmost consideration to minimizing the impact on the surrounding area and maximizing retention of "wilderness character." Barriers will be constructed in such a manner as to blend as well as possible with the surrounding landscape.

Approved piscicides will be used to remove all non-native and/or hybridized fish from project areas following barrier construction and/or modification. In lake environments, the piscicide will be applied below the lake surface from a motorized boat. In stream environments, the piscicide will be applied at multiple metered stations along the stream. In flowing water, piscicide application will begin at the most upstream extent of the project area and progress downstream. In both lake and stream settings, all connected waters (springs, seeps, wetlands) found to contain fish will also be treated. The piscicide application will strictly follow EPA-approved label guidelines for treatment concentration, applicator safety, public safety, and all other requirements.

Amphibians and aquatic invertebrates within each project area will be assessed prior to, during, and following the use of piscicides. To the greatest extent possible, the timing and concentration of treatments will be designed to minimize impacts on amphibian s and aquatic

invertebrates. Mitigation for treatment will also occur through careful assessment of fish-bearing versus fishless waters in a project area, to avoid unnecessarily treating areas from which non-target organisms could re-colonize.

Following barrier construction and eradication of non-native fish from project areas, genetically unaltered native fish will be restocked. Native fish embryos (eyed-eggs) will be placed in remote site incubators that have been positioned in flowing waters (stream, tributaries, and/or lake inlet/outlets). After the eggs hatch and the young fish (fry) develop for several weeks, the fry will be able to swim out of the incubator. In addition, native fish will be reintroduced by directly stocking the project waters with fry, juveniles, adults, or a combination of ages, that have been captured by electrofishing and netting from genetically unaltered populations elsewhere.

Stocking native fish will require sources of genetically unaltered fish. Sources of fluvial GRY and WCT are extremely limited, but do occur in the Upper Missouri River drainage in Montana. Native WCT persist in two locations in the park, including Last Chance Creek and Geode Creek, and both populations will be used for conservation efforts within the historic range of WCT. Although YCT in most locations are greatly threatened, populations do remain within the park that will be used for restocking project areas. In addition, native brood stocks of hatchery and wild origin will be developed and used. Goose Lake (near the Firehole River) and Trout Lake (near Soda Butte Creek) will be used to develop wild brood sources for WCT and YCT, respectively. These brood sources will be developed through the eradication of non-native fish and, if necessary, introduction of genetically unaltered native fish.

In situations where limiting nonnative fish influence on native fish is the only reasonable and prudent option, NPS will use angling, electrofishing, trapping, and netting to selectively reduce the abundance and distribution of nonnative fish, without overly harming (or completely eradicating, as with piscicides) the coexisting native fish. In addition, genetic swamping, via the introduction of genetically unaltered native fish as embryos, juveniles, or adults into an already compromised (hybridized) native fish population, will be used in some project areas for the purpose of increasing the percentage of native fish alleles in the receiving population.

The status of native and nonnative fish in streams, rivers, and lakes across Yellowstone National Park will be assessed using standard fisheries assessment protocols. Population size estimates will be derived using depletion and mark-recapture techniques. The collection of additional information from captured fish, such as length, weight, and age (based on scales), will allow population age structure, growth rates, and biomass (size of population by weight) to also be estimated. Samples will be taken to assess the health and genetic composition of fish populations. The processing and assessment of health and genetic samples will be conducted by partner laboratories in the region.

MITIGATION MEASURES

The following mitigation measures, which were developed to minimize the incidence and severity of adverse effects, will be carried out as needed during implementation of the preferred alternative.

Lake Trout Suppression

- Contractors will take proper precautions for aquatic nuisance species (cleaning, inspections, etc.) before putting their boats or other equipment into any body of water. All boats and equipment will be inspected by park staff prior to launching in Yellowstone Lake.
- A spill plan will be followed in case of a fuel leak on the ground or in the lake.
- Contractors and NPS personnel will avoid areas of Yellowstone Lake with known geological resources. Personnel will note areas where unusual bottom substrate is brought up in the nets and avoid these areas in the future.
- Contractors and employees will be directed to lift nets as the boat is operated over the nets rather than allowing the net lifter to drag the boat along. Dragging the net along the bottom will also be discouraged.
- Contractors and NPS personnel will avoid areas with high YCT by-catch as much as possible, check nets frequently to minimize YCT mortality, and check nets more often in areas where YCT are more likely to be caught. Net checks will be done daily or every other day in areas that are shallow during spawning season and new areas where catch rate is unknown. To minimize handling of and injury to YCT by-catch, personnel will quickly remove and release any captured YCT that appear alive and healthy. Park fish biologists will use information gained from other LKT removal projects to minimize catch and mortality of non-target species.
- The handling of LKT carcasses will be accomplished as much as possible on Yellowstone Lake. If fish carcasses are brought to shore for measurements, data recovery, marketing, or donation, storage and sanitation procedures will be followed to avoid attracting bears and other wildlife into developed areas. All lethally taken LKT or other fish mortalities will be disposed of by sinking them in water more than 65 m deep to avoid creating an attractant to wildlife.
- All gillnets will be marked with buoys at each end for visibility by boaters. Trapnets will be marked with three buoys and six bobber floats to delineate the extent of trapnet for visibility by boaters.
- Signs will be posted or available to the public at the marinas and visitor centers informing visitors of the LKT removal effort. A large map will be posted at Bridge Bay Marina marking net locations for visitor safety and awareness.
- Areas will be surveyed for Yellowstone sand verbena prior to initiation of any physical work to reconnect isolated tributaries. Tributaries with areas supporting or suspected to support Yellowstone sand verbena near the sand bars will be surveyed by vegetation specialists prior to initiating work. If impacts to Yellowstone sand verbena could not be mitigated, the tributary will be removed from further consideration for enhancement of YCT spawning access.

General Construction

- For each fish barrier constructed, interdisciplinary collaboration will take place to minimize the change to the stream's natural hydrologic conditions.
- Upon completion of hydrologic assessment/analysis for each fish barrier, a determination will be made as to extent of wetland resources impacted and whether project-specific Statement of Findings is warranted.
- Spawning stream work for weir development and barrier removal will not take place during the YCT spawning run when these areas are closed during the Bear Management

Area restriction (until July 15th for most tributaries and August 11th for Clear Creek and the east shore of Yellowstone Lake).

- To minimize impacts to park visitors by trail and campsite closures, variations on construction and project timing will be considered. One option will be to conduct most work in the off-season or shoulder seasons (October–December and January–May).
- Sites will be surveyed for rare plant species, cultural resources, and wetlands before implementation of projects on a case by case basis.
- To the extent possible, the creation of social trails (the repeated use of the same pathway) by fisheries crews working near lakes and streams will be avoided to reduce long term trampling of vegetation and soil compaction. In any instance where a social trail is inadvertently created, upon completion of the project Yellowstone National Park resource protection specialists will be brought in to rehabilitate the area.
- Some trees may be removed, but other existing vegetation at the site will not be disturbed to the extent possible. Weed control methods will be implemented to minimize the introduction of noxious weeds. Because disturbed soils are susceptible to erosion until revegetation takes place, standard erosion control measures such as silt fences and/or sand bags will be used to minimize any potential soil erosion.
- All disturbed areas will be restored as nearly as possible to pre-construction conditions shortly after construction activities are completed. Revegetation and recontouring will be designed to minimize the visual intrusion of the structure. Revegetation efforts will strive to reconstruct the natural spacing, abundance, and diversity of native plant species.
- For each fish barrier constructed, regular monitoring of structural integrity and regular maintenance will be conducted to help assure that the restoration gains will be essentially permanent.

Cultural Resources

- Because archeological sites are known to be concentrated on stream banks and only a small portion of archeological sites are evident from surface deposits, shovel tests will be conducted to ensure that no buried cultural deposits will be disturbed at barrier or weir construction sites. If subsurface cultural material is found, the barrier will be moved to an area without buried cultural deposits.
- In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during project implementation, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) will be followed. Project work will cease immediately and the NPS will consult with the affected tribe(s) and, if necessary, the Idaho, Montana, or Wyoming state historic preservation office. The location of any such ethnographic sites will remain undisclosed.
- If any cultural materials are discovered during construction, work in the area will halt immediately, the appropriate federal agency will be contacted and the materials evaluated by an archeologist or historian meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983).

Use of Piscicides

- Mitigating the effects of piscicide on human health and safety will be ensured by strict adherence to all label guidelines and other applicable state, federal, local, and agency regulations pertaining to application, handling, storage, and transportation.
- Each project that requires piscicide use will be managed by a certified piscicide applicator.
- Risks from piscicides to the public will be mitigated using public awareness through press releases prior to project initiation and signage (placards) in and around the project area (trailheads, as well as information available at backcountry offices). In some cases the public will be temporarily restricted from entering the project area, particularly treated waters, during and after the treatment.
- Actions that will take place in backcountry and recommended wilderness areas will adhere to Yellowstone National Park's Minimum Requirement Policy. Approval of a Minimum Requirement Analysis will be required for each action that requires structures, flight landings, or mechanized equipment in recommended wilderness areas.
- Methods to mitigate piscicide use include: lowering piscicide concentration while still achieving complete eradication and adjusting treatment timing to avoid harming juvenile amphibians.
- Survey work will be completed prior to piscicide application to establish the distribution of target and non-target fish and presence of fishless water so that waters can be left untreated if treatment is not required.
- Mitigating the impacts to non-target organisms will also be accomplished by minimizing treatment concentration and duration as well as collecting and disposing of as many fish carcasses as possible immediately following treatment to avoid their consumption by bears and other animals.

Other Measures to Reduce Impacts to Grizzly Bears

- To reduce the potential for attracting grizzly bears to Yellowstone Lake operations, all fish captured during gillnetting operations will have bladders punctured and then be sunk.
- To reduce the potential for attracting grizzly bears, all chemically treated fish will be removed from streams.
- To reduce the potential for grizzly bear–human conflicts, contractors working on native fish restoration projects will be instructed regarding food, barbecue grill, and garbage storage while living and working in the park.
- To reduce the potential for human-caused grizzly bear mortality in developed areas where native fish will be restored, all human foods, garbage, and other anthropogenic attractants will be handled, stored, and disposed of in a bear-proof manner.
- Restored spawning streams will be closed to public access during spawning activity. Trails, picnic areas, lodging and campground loops in the vicinity of these streams will be closed when bear activity is observed during spawning. Specific Bear Management Area restrictions will be adhered to.

ALTERNATIVES CONSIDERED

Alternatives considered included 1) no-action alternative; 2) an alternative that will conserve Yellowstone Lake YCT by increased netting of LKT (the carcasses returned to the lake) by private sector contract netters, and it will conserve GRY, WCT, and YCT elsewhere in the park

by using approved piscicides to remove non-native fish and restocking native species from genetically unaltered brood sources; 3) an alternative identical to alternative 2, except that LKT will be removed from Yellowstone Lake and marketed or donated by the contract netters; and 4) an alternative that will attempt to conserve native fish using more limited methods, not including contract netters or piscicides.

Of the four alternatives, only alternatives 2 and 3 would fully meet plan objectives to preserve, protect, and restore the full range of the park's native fish species and natural ecosystem processes over the long term. Aquatic resources will be adaptively managed using a hierarchical series of desired outcomes, each chosen based on conservation value, technical feasibility, environmental impact analysis, and resource availability. Long-term monitoring of performance metrics will be used to track responses to conservation actions, guide the adjustment of these actions, and determine the success or failure of individual projects.

None of the alternatives would have more than moderate impacts to the environmental setting, including geology, water quality and quantity, wetlands, and vegetation; to fish and wildlife resources, including special status species; or to social and economic resources, including health and human safety, visitor use and experience, park operations, and wilderness areas. Alternative 2, the preferred alternative, will result in both short-term adverse and long-term beneficial impacts to these resources. None of the alternatives would result in impairment of park resources.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative 2 is the environmentally preferred alternative. The environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed by §101 of the National Environmental Policy Act. This includes alternatives that:

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings

(3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

(4) preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice

(5) achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative 2 (Preferred Alternative) is the NPS Environmentally Preferred Alternative because it will best meet the six criteria. Alternative 2 will preserve and restore native fish to the greatest extent possible in locations across the park. It will meet criteria 1, 4, 5, and 6 because it will reverse the decline of native fish species in the park. It will not fully meet

criteria 2 and 3 because it will result in a short-term degradation of natural resources, pose a short-term risk to project personnel health and safety from the use of piscicides, and result in long-term, minor adverse impacts to wilderness areas through the long-term use of in-stream fish barriers and weirs. However, it will in the long term meet criteria 2 and 3 in that it will result in the restoration of genetically unaltered native fish populations. This will lead to a more ecologically productive environment and more robust sport fishery.

WHY THE PREFERRED ALTERNATIVE WILL NOT HAVE A SIGNIFICANT EFFECT ON THE HUMAN ENVIRONMENT

As defined in 40 CFR §1508.27, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Long term impacts of the preferred alternative will include beneficial impacts to visitors from restoration of native fish populations, native fish consumer species (e.g. river otters, grizzly bears, eagles, and ospreys), and natural ecosystem processes. Moderate beneficial impacts of the preferred alternative will occur for the following impact topics: wetlands and waters of the U.S.; fish resources; wildlife resources; special status species; socioeconomics; visitor use and experience; and wilderness. Long term impacts of the preferred alternative will include adverse impacts to visitors from crew presence on Yellowstone Lake and in backcountry areas; use of boats, rafts, and other mechanized equipment; and use of nets, piscicides and electrofishing to remove non-native fish and/or monitor fish populations. Moderate adverse impacts of the preferred alternative will occur for the following impact topics: geologic resources; wetlands and waters of the U.S.; aquatic resources (other than fish); fish resources; and special status species. Impacts of other alternatives varied and are described in the EA.

The degree to which the proposed action affects public health or safety

Under the preferred alternative, combined impacts to human health and safety will be short and long-term, minor, and adverse. In the Yellowstone Lake watershed adverse impacts will be from large-scale LKT removal and other activities on Yellowstone Lake because of the potential for cuts and abrasions from handling knives, ropes, and net materials; slips, trips, and falls on and around boats, docks, and staging areas; muscle strains and pulls from lifting and moving large and/or heavy objects; and repetitive stress injuries from constant bending, pulling, untangling fish from gillnets, and other activities. In addition, the preferred alternative will result in the recovery of YCT to Yellowstone Lake tributaries in and near developed areas, and it is likely that grizzly bears would return to fish these streams during the spring YCT spawning period, increasing the likelihood for bear-human conflicts and resulting in minor, long-term, adverse impacts to health and human safety. Outside the Yellowstone Lake watershed, short-term, minor, adverse impacts to health and human safety will occur from non-native fish removal using piscicides and other methods as well as other native fish conservation activities on streams, rivers, and lakes. This project has a small potential to result in slips, trips, and falls while crossing and wading in streams; electrical shock when electrofishing; and drowning and/or hypothermia when using small motorized and non-

motorized boats, working in inclement weather, and working in a wilderness setting. Using NPS guidance for Operational Leadership, a GAR model has been completed for the lake trout suppression project, and several mitigations were developed to reduce risk of injury or death on Yellowstone Lake. Detailed safety plans will be completed for all major conservation actions to be conducted.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas

Most of Yellowstone National Park's backcountry, including many areas of Yellowstone Lake, is recommended wilderness. The NPS will apply a Minimum Requirement Analysis (MRA) in native fish conservation decisions affecting wilderness areas. The MRA will describe the minimum requirement and tools necessary to accomplish the projects and the mitigation measures needed to minimize impacts to wilderness character and backcountry visitors.

The mainstem of the Snake River, the Lewis River and the Lewis River channel between Lewis and Shoshone lakes (Snake River headwaters) were formally designated Wild and Scenic Rivers within the park on March 30, 2009 under the Omnibus Public Lands Management Act of 2009 (123 STAT. 991). Actions under the Native Fish Conservation Plan will not take place within these segments or within tributaries to these segments. The Snake River Headwaters Wild and Scenic River system is independent from (not connected to) other waters within the park where native fish conservation actions will occur. Therefore, it is not anticipated that the actions proposed by the alternatives in this EA will incur direct or adverse impacts to the designated Wild and Scenic Rivers. If in the future such actions were determined necessary, further NEPA and Section 7 assessment will take place.

The degree to which effects on the quality of the human environment are likely to be highly controversial

Concerns regarding native fish conservation actions within Yellowstone National Park have been widely discussed in the news media and on internet-based (social) discussion forums. Spurred by public scoping for the plan in April 2010, controversy on its effects has been most evident as it relates to the potential effects of cutthroat trout loss from Yellowstone Lake, and the impact such a loss would have on the quality of the human environment. As described in the EA, all effects to park resources are moderate or less. While the sights of crews on Yellowstone Lake and in backcountry areas; use of boats, rafts, and other mechanized equipment; and use of nets, piscicides and electrofishing to remove non-native fish and/or monitor fish populations have generated some comments, the majority of public comment is in favor of this plan which greatly decreases potential for controversy. These impacts also become balanced by the recovery of native fish populations in Yellowstone Lake and elsewhere across the park.

A 45 day public review of the Native Fish Conservation Plan/EA ended on January 31, 2011. The NPS received 2998 pieces of correspondence, comprising 10,280 comments. The majority of correspondence (approximately 67% mostly from form letters) favored all aspects of the preferred alternative with an emphasis on the conservation of YCT on

Yellowstone Lake. Less than 3% of correspondence did not support the plan or some aspect of it. Therefore, the overall comment record supports the conclusion drawn in the EA that there are no highly controversial effects.

The degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks

Mitigation measures (listed above) will be employed to greatly reduce highly uncertain, unique or unknown risks. All conservation actions will be monitored for potential effects on the human environment. Changes to conservation actions will be guided by an adaptive management framework and scientific peer review to reduce uncertainty and avoid risk. Therefore, because of the combination of monitoring, implementation of mitigations, and scientific review, the degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks is very low.

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration

The Native Fish Conservation Plan/EA is not the first EA of its kind in the NPS. Netting, piscicides and other means to remove nonnative fish have been used for several decades in many other NPS units to restore imperiled native species. Historically, the NPS used piscicide (for the first time) in 1938 to remove yellow perch from Goose Lake, Yellowstone National Park. In 1946, the NPS used piscicide to remove non-native suckers from Bear Lake in Rocky Mountain National Park.

More recently, Crater Lake National Park, Glacier National Park, Great Basin National Park, Great Smoky Mountains National Park, North Cascades National Park, and Yellowstone National Park have completed plans/EAs to support native fish conservation through nonnative fish removal. The Glacier National Park plan included the large-scale removal of nonnative lake trout from a remote lake.

Actions under the Native Fish Conservation Plan for Yellowstone National Park will be guided by an adaptive management strategy. There are recent examples of its use for the management of other natural resource issues, including the management of bison in Yellowstone National Park.

Because there are existing plans for native fish conservation and existing plans guided by an adaptive management strategy at Yellowstone National Park at other parks in the National Park System, action for the Native Fish Conservation Plan for Yellowstone National Park will not set any NPS precedent. The preferred alternative is consistent with those permitted elsewhere.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

No major (significant) cumulative effects were identified in the EA.

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Various historic districts, structures, and road segments within Yellowstone National Park are listed on the National Register of Historic Places. Compliance with §106 of the National Historic Preservation Act was completed by concurrence with the NPS determination of no historic properties affected by the Montana State Historic Preservation Officer (SHPO) on January 11, 2011. The Wyoming State Historic Preservation Officer concurred with a 30-day no response concurrence on January 22, 2011. No historic properties are located within close proximity to any Idaho cultural resources.

The degree to which the action may adversely affect an endangered or threatened species or its critical habitat that has been determined to be critical under the Endangered Species Act of 1973

Canada lynx, grizzly bear, and grey wolf are federally-listed threatened species in Yellowstone National Park. There are no federally-listed fish species in the park. Analysis determined that increased populations of native fish will have long-term moderately beneficial impacts to most special status species (federal and state-listed). However, restored YCT could increase the incidence of human/bear conflicts along spawning streams and could precipitate a long-term, minor adverse impact on grizzly bears in these areas during spring spawning periods. In order to mitigate this minor adverse effect, mitigation measures (listed above) will be used to reduce bear-human interactions, conflicts, and confrontations so that management removals of grizzly bears are not necessary. The NPS reached a 'may affect, not likely to adversely affect" determination in consultation with the FWS. The U.S. Fish and Wildlife Service concurred with the determination of no effect on threatened or endangered species in their letter dated January 13, 2011.

Whether the action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment

The action will not violate any federal, state, or local laws or environmental protection laws.

IMPAIRMENT

National Park Service's Management Policies, 2006 require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of these resources or values. An impact to any park resource or value may, but does not necessarily, constitute impairment, but an impact would be more likely to constitute impairment when there is a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

An impact would be less likely to constitute impairment if it is an unavoidable result of an action necessary to pursue or restore the integrity of park resources or values and it cannot be further mitigated.

The park resources and values that are subject to the no-impairment standard include:

- the park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;
- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- any additional attributes encompassed by the specific values and purposes for which the park was established.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The NPS's threshold for considering whether there could be impairment is based on whether an action would have major (or significant) effects.

Impairment findings are not necessary for visitor use and experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, because impairment findings relates back to park resources and values, and these impact areas are not generally considered park resources or values according to the Organic Act, and cannot be impaired in the same way that an action can impair park resources and values.

After dismissing the above topics, those remaining to be evaluated for impairment fall in the categories of environmental setting, biological resources, and special status species. Only those impact categories where analysis conclusions were found to be up to the moderate adverse level are discussed in this impairment analysis.

Geologic Resources

Geologic resources, including hydrothermal resources, are one of the fundamental resources for which Yellowstone was set aside. The preferred alternative would result in direct, short-term and long-term, negligible to moderate adverse impacts to geological and hydrothermal resources. This is because a small proportion of the hydrothermal features in Yellowstone Lake would be modified by gill nets; and temporary disturbance to lake or terrestrial sediments would take place during implementation of lake and stream actions. Because of the localized nature of these impacts, there would be no impairment to geologic resources.

Wetlands

Over 357 square miles of wetlands are found in Yellowstone. These wetlands add to the species diversity of the park as well as provide essential habitat for Yellowstone's rare plants, reptiles, amphibians, insects, birds, mammals and fish. The preferred alternative would result in direct, short-and long-term, negligible to moderate adverse impacts to wetland resources in Yellowstone. This is because actions related to fish barrier construction and non-native fish removal would impact wetland vegetation and wetland associated fauna. Mitigation measures would include interdisciplinary collaboration on each stream segment to minimize changes to hydrologic processes (and therefore changes to wetlands); survey and restoration actions after implementation to reduce the chance of exotic species invasion as well as compensation for wetlands disturbance through such actions as culvert replacement. Because these impacts will be localized to specific stream corridors where actions to restore native fish will take place and because impacts from these actions would be minimized through extensive mitigation, there would be no impairment to wetland resources.

Aquatic Resources

Aquatic resources found in Yellowstone that would be impacted from the preferred alternative include plankton, aquatic macroinvertebrates and amphibians. These organisms are important components to the processes of an aquatic ecosystem. The preferred alternative would have direct and indirect, short- and long-term, negligible to moderate adverse impacts as well as indirect, long-term, negligible to minor beneficial impacts to aquatic resources in the park. The moderate adverse impacts would be primarily because the chemical removal actions used for non-native fish removal would impact zooplankton, macroinvertebrates and larval amphibians. While chemical removal would mean that resident populations would be killed, impacts would be retained at the moderate level due

to extensive mitigation measures incorporated during implementation. These mitigation measures would emphasize surveys prior to treatment to identify non-target species and consequently adjusting treatments to minimize impacts through such modifications as timing of treatments to avoid sensitive life history stages of aquatic organisms found, avoiding non-target organisms through relocation, or simply not treating if impacts beyond moderate would be a possibility. Ultimately, the impacts to aquatic resources would be beneficial though, based on the premise that an ecosystem based on a healthy native fish component would eventually (1 to 3 years after treatment) support a higher diversity of native aquatic organisms. Because of the extensive mitigation measures in place and because of the long-term beneficial impacts, there would be no impairment to aquatic resources.

Fish Resources

The Yellowstone fishery is comprised of 12 native species. The park's native fish populations have been altered by fish stocking as well as by overharvest, whirling disease, drought, dewatering of streams and predation from non-native fish species such as lake trout. The preferred alternative would have indirect and direct, short- and long-term, negligible to moderate adverse impacts, but in the long-term, direct and indirect, moderate beneficial impacts to native fish resources in the park. The adverse impacts would be due to the immediate removal of native fish during chemical removal; natives such as sculpin would be impacted. This treatment would only be used after determination that mechanical removal would not be effective to eradicate non-natives. After treatment though, all native fish species would be restocked and native fish populations would benefit from returning to their historic range within the park and reducing extirpation risk within the Yellowstone ecosystem. Therefore, while immediate adverse impacts would take place, in the long term, native fish would benefit from the elimination of non-native predators and the re-establishment of native ecological processes. Because the long-term results of these efforts would be beneficial to native fish, there would be no impairment to fish resources.

Special Status Species

Special Status species are animal and plant species that scientific evidence indicates need protection, restoration, and/or conservation within a park because they are declining or have exceptionally limited distribution. Protection of special status species is discussed in the park's strategic plan (NPS 2000) and is required by statute (Endangered Species Act) and NPS policy. Special status species include mammals, birds, fish (including YCT, WCT, and GRY), macro invertebrates and plant species in Yellowstone. Some of these species are also federally listed under the Endangered Species Act (gray wolf, grizzly bear, and Canada lynx) or are considered Species of Special Concern by the FWS.

The preferred alternative would have direct and indirect, short- and long-term, moderate and adverse impacts, as well as indirect, long-term, moderately beneficial impact to special status species. Adverse impacts in the Yellowstone Lake ecosystem would be due to the increased potential to capture individual special status bird and fish species during gill netting operations; the use of trap nets would minimize the impacts from increased operations, though. Impacts to species would also be mitigated by avoiding high concentrations of these species during gill netting operations. Another mitigating measure

to protect special status species would be that tributary reconnection actions would not take place in areas where the Yellowstone sand verbena is located during pre-treatment surveys.

The potential to impact an aquatic macro invertebrate and amphibian species of concern would be possible outside the Yellowstone Lake ecosystem. While chemical removal would mean that resident populations would be killed, impacts would be retained at the moderate level due to extensive mitigation measures incorporated during implementation. These mitigation measures would emphasize surveys prior to treatment to identify non-target species and consequently adjusting treatments to minimize impacts through such modifications as timing of treatments to avoid sensitive life history stages of aquatic organisms found, avoiding non-target organisms through relocation, or simply not treating if impacts beyond moderate would be a possibility.

Finally, the return of YCT could also increase the incidence of human/bear conflicts and could precipitate a long-term, minor adverse impact on grizzly bears in these areas. In order to mitigate this minor adverse effect, mitigation measures (e.g. area closures during spawning season, sinking of gill netted fish, removing fish carcasses from treatment areas) will be used to reduce bear-human interactions, conflicts, and confrontations so that management removals of grizzly bears are not necessary. Therefore NPS can reach a 'may affect, not likely to adversely affect" determination in consultation with the FWS.

Given all the mitigation measures discussed, and because the long-term results of these efforts would be beneficial to several special status species, there would be no impairment to special status species.

Conclusion

As guided by this analysis, good science and scholarship, advice from subject matter experts and others who have relevant knowledge and experience, and the results of public involvement activities; and given the impacts discussed have been mitigated as much as possible and are unavoidable results of an action necessary to pursue or restore the integrity of park resources or values, it is the Superintendent's professional judgment that there would be no impairment of park resources and values from implementation of the preferred alternative

PUBLIC INVOLVEMENT AND NATIVE AMERICAN CONSULTATION

Twenty-six Native American tribes were contacted at the beginning of the scoping period with a newsletter to announce the opportunity for tribes to comment and attend public scoping meetings. Newsletters were mailed to the following tribes to assist in determining if there were any ethnographic concerns with the proposed actions and if they wanted to be involved in the environmental compliance process.

Kiowa Tribe of Oklahoma
Shoshone-Bannock Tribes
Flandreau Santee Sioux Tribe
Sisseton-Wahpeton Sioux Tribe
Crow Creek Sioux Tribe

Yankton Sioux Tribe
Lower Brule Sioux Tribe
Rosebud Sioux Tribe
Cheyenne River Sioux Tribe
Oglala Sioux Tribe
Turtle Mountain Band of Chippewa Indians
Spirit Lake Sioux Tribe
Crow Tribe
Northern Cheyenne Tribe
Confederated Salish and Kootenai Tribes
Assiniboine & Sioux Tribes, Fort Peck
Chippewa Cree Tribe
Gros Ventre and Assiniboine Tribes
Confederated Salish and Kootenai Tribes
Comanche Tribe of Oklahoma
Eastern Shoshone Tribe
Northern Arapaho Tribe
Shoshone-Bannock Tribes
Nez Perce Tribe
Coeur d'Alene Tribe
Confederated Tribes of the Umatilla Indian Reservation

No ethnographic resources were identified as a result of this scoping. If any ethnographic resources are identified subsequently, impacts to them will be mitigated in consultation with the tribes.

The environmental assessment was made available for public (including Tribal) review and comment during a 45-day period ending January 31, 2011. A postcard announcing the availability of the Plan was mailed to over 650 interested parties, including various federal and state agencies, affiliated Native American tribes, local governments, and local news organizations. The Plan was made available in electronic and hard copy formats via United States Postal Service by request through a NPS phone number or by accessing the NPS Planning, Environment, and Public Comments (PEPC) website.

The NPS hosted two public review and comment meetings in January 2011 during the public comment period. One was held in Bozeman, Montana on January 5th with 28 attendees, and one in Cody, Wyoming with 33 attendees.

Opportunities to comment were through the PEPC website, by US Mail, and at public meetings. A total of 2998 pieces of correspondence were received on the EA during the public comment period. Of this total, 13 form letters comprised approximately 48% (1435) of the correspondence received. A total 10,280 comments were selected by compliance staff for further analysis and coded under 65 codes. Of those, 728 unique substantive comments were grouped under 108 concern statements and were analyzed and can be found following the Errata Sheets.

Each piece of correspondence was coded at least once to determine the support and opposition of the plan. The majority of correspondence (approximately 67% mostly from form letters) favored all aspects of the preferred alternative with an emphasis on the

conservation of YCT on Yellowstone Lake. Approximately 22% of the correspondence received was blank, a duplicate, or incomplete. Approximately 8% of the correspondence comprised of letters that staff were unable to determine support or opposition of the plan. The remaining 3% comprised of respondents who did not favor the plan or one particular aspect of it.

Substantive comments centered on program/project emphasis areas, lake trout suppression methods, disposition of lake trout carcasses, and use of piscicides. Responses to these comments resulted in slight modifications to the text of the EA that are listed in the Errata Sheets. The text edits/modifications are also summarized in the Preferred Alternative section above. The modifications are clarifying in nature, are intended to better meet the purpose and need of the EA, and do not have bearing on the determination of significant impact. The FONSI and Errata Sheets will be sent to all who commented. Three comments were received suggesting that lake trout could be netted by Native American Tribes or that lake trout carcasses could be given to them. These along with all other substantive comments are addressed in the attached comment response section.

CONCLUSION

As described above, the preferred alternative does not constitute an action meeting the criteria that normally require preparation of an environmental impact statement (EIS). The preferred alternative will not have a significant effect on the human environment. Environmental impacts that could occur are limited in context and intensity, with generally adverse impacts that range from localized to widespread, short to long-term, and negligible to moderate. There are no unmitigated adverse effects on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law.

Based on the foregoing, it has been determined that an EIS is not required for this project and thus will not be prepared.

Recommended: Paul N Wenk — 5/9/2011
Superintendent — Date

Approved: — 5/18/11
Regional Director, Intermountain Region — Date

ERRATA SHEETS
NATIVE FISH CONSERVATION PLAN/ENVIRONMENTAL ASSESSMENT
YELLOWSTONE NATIONAL PARK

According to NPS policy, substantive comments are those that 1) question the accuracy of the information in the EA, 2) question the adequacy of the environmental analysis, 3) present reasonable alternatives that were not presented in the EA, or 4) cause changes or revisions in the proposal.

Some substantive comments may result in changes to the text of the EA, in which case, they are addressed in the *Text Changes* section of the Errata Sheets. Other substantive comments may require a more thorough explanatory response and are addressed in the *Response to Comments* section. NPS responds to all substantive comments in either or both of these sections.

Text Changes

Page vii – The fourth line in the Table of Contents should have a dot leader between "Tables" and "x"; subtitles should not be italicized.

Page 6, Figure 3 – Change label in figure from "Native" to "Native Only"

Page 10 - Remove "Beyond the issue of reduced biodiversity or fish quality"

Page 16 - Change "historic ranges" to "historical ranges"

Page 17 – In Section 1.8, add the Administrative Procedures Act, Clean Water Act, and the Endangered Species Act to provide a better explanation of the relationship of the Act to the plan and to provide a description of how the plan is consistent with each Act.

Page 25 – Add a paragraph to clarify that the plan includes all native fish, not just sport fish.

The EA discusses native fish across YELL in the broad terms of cutthroat trout and grayling. This is done because these species are readily recognizable and widely distributed across the park and the region. However, this plan is designed to benefit all native fish species in YELL, not just those considered "sport fish." The removal of non-native species and other proposed conservation actions are expected to benefit all native species of minnows, salmonids (trout, grayling, and whitefish) suckers, and sculpins. In cases where any native species has been lost due to non-native fish invasion, or is lost in the course or non-native fish removal, the species will be restored through the methods of restocking described in the plan.

Page 31 – In section 2.2.1, add "NPS would continue to support research to determine best practices to used during watershed-scale fish restoration to ensure that non-target species, including macroinvertebrates, amphibians, and other native fishes remain as viable populations within a drainage" to the end of the last paragraph.

Page 39 – The trap net diagram is provided by the Michigan Sea Grant Program.

Page 45 – In section 2.3.2, first paragraph, prior to last sentence, add "Support of research to determine best practices to use during watershed-scale fish restoration would continue to ensure that non-target species, including macroinvertebrates and amphibians remain unharmed."

Page 48 – Under **Chemical Removal of Fish,** reference to Table B-2 should be Table B-3.

Page 49 – Add "Surveys to establish presence of fishless water will also include approved methods used to survey amphibians." to the end of the first paragraph at the top of the page.

Page 60 – In Table 9, add a row with "National Pollution Discharge Elimination System Permit" listed as Name of Permit and "US EPA" as Agency.

Page 63 – Under section 2.7.4, fifth bullet, change "juvenile" to "larval".
Add the following bullet items under section 2.7.4:

- The park will conduct a survey of breeding amphibians that follow methods used by previous park surveys and by outlined by NPS (2008) with modifications that target wetlands confined within the project watershed. Specifically viable wetlands within 0.8 km (0.5 mi) of areas targeted for piscicide application will be surveyed for amphibian breeding site occupancy. Amphibian surveys will be conducted 3 times prior to treatment and, when feasible, timing of piscicide application will be adjusted to take place after larval amphibians have metamorphosed. Lowest concentrations of piscicide will be used to assure complete eradication of fish while having the least amount of impact on non-target organisms including amphibians. Amphibian sampling will continue up to 5 years post-treatment to evaluate long-term responses to rotenone treatment.
- Inventory and monitoring of stream aquatic invertebrates will follow procedures

Page 80 – Under **Blotched tiger salamander**, add to the second sentence "where native fish restoration projects are being proposed. Adults spend a great deal of their time in burrows but return to the water for breeding."

Under **Boreal chorus frog,** after the first sentence, add "They are believed to hibernate underground. After emergence boreal chorus frogs move to breeding sites that include marshes, lakes, beaver ponds, vernal ponds, and almost any shallow water with emergent vegetation to which the eggs can be attached."

At the end the section, add "Calling may begin as early as April in some parts of the region. After breeding season, adult boreal chorus frogs are most likely to be encountered in wet meadows or in grass along streams (Koch and Peterson, 1995). Metamorphosis of larval frogs is dependent largely on timing of breeding season and elevation with larvae at lower elevations developing sooner than larvae at higher elevations. Boreal chorus frogs breeding areas are found near many of the proposed fish restoration sites including the Northern Range, and in the Grayling and Specimen
creek drainages."

Add the following section: **Northern sagebrush lizard** – Northern sagebrush lizard (Sceloporus graciosus graciosus) can be found along the lowest portions of the Yellowstone River in Yellowstone Park near Gardiner, MT, upstream at least 5 km to the mouth of Bear Creek. This lizard is found in many other places throughout Yellowstone National Park, associated with areas that have geothermal influence and have rocky, subterranean crevices or logs on the ground (Koch and Peterson, 1995).

Page 81 – Replace paragraph pertaining to Boreal toads with "**Boreal toads** (Bufo boreas boreas) are widely distributed throughout Yellowstone from the lowest elevation up to about 2865 m (9400 ft) and can be locally common to abundant. They have been found breeding in large and small lakes, beaver ponds, temporary ponds, slow-moving streams, and backwater channels of rivers (Koch and Peterson, 1995). They typically breed in park areas with water chemistry characteristics that include a pH >8.0, high conductivity, and high acid-neutralization capacity; many of the sites have a geothermal influence (Koch and Peterson, 1995). Boreal toad breeding areas have been found in the upper Geyser Basin and the Swan Lake Flat area. Metamorphosis of boreal toad tadpoles has been observed at considerably varying times of year in this region and has been documented as early as mid-June through early September. Boreal toads can also be found in riparian and riverine area where they feed if adequate cover is available. Although declining throughout much of their range, boreal toads remain widespread throughout the park. Juvenile and adult boreal toads have been documented in the northern range within drainages of proposed native fish restoration activities. During five years of amphibian monitoring, Yellowstone National Park staff have not documented boreal toad breeding sites within proposed areas of native fish restoration."

Add **Plains spadefoot toad** as a heading to the third paragraph.

Page 87 – Replace paragraph pertaining to Columbia spotted frog with "This frog species is very common throughout the park. Adults are often found along streams, rivers, lakes, ponds, and marshes. Egg deposition can begins in early spring. Columbian spotted frogs may breed in both fish and fishless water Eggs are laid on the bottom of the pond and swell to a softball-sized mass from 150 to 500 cm3 floating just under the surface of the water at sites with no current, or flow, usually on the north shore in full sunlight. Egg masses may be attached to rooted vegetation or they may float free (Koch and Peterson, 1995). Hind legs begin developing 40-50 days after hatching. Metamorphosis is dependent largely on timing of breeding season and elevation with larvae at lower

elevations developing sooner than larvae at higher elevations. We have observed newly metamorphosed juvenile frogs in early July (northern range) and as late as early September (Specimen Creek drainage). and is known to breed in the park's Northern Range and Grayling Creek where native fish restoration projects are proposed."

Page 111 – At the top of the page, replace "hydrologic changes" with "hydraulic changes".

Page 120 – Under Section 4.2.3.2, in the last paragraph change the reference to Alternative 1 to Alternative 2.

Page 133 – In line 4, change "Of these, 44% are returned" to "Of these, 44% were returned". In line 6, delete the first comma.

Page 211 – Under 2a, change "Wilderness mitigations including an approved MRA outlined in Chapter 2 would be implemented" to "Wilderness mitigations would include developing and implementing an MRA following Yellowstone National Park guidelines."

Page 221– In the Glossary of Terms add the definition for Maintained Barrier:

Maintained Barrier– a barrier to upstream fish movement that is 1) Inspected annually for obvious defects; 2) Repaired or modified as needed to maintain isolation of upstream habitat; and 3) Routinely tested by marking fish downstream and then surveying upstream to determine passage.

Page 225 – In the Literature Cited section, add the following two references:

National Park Service. 2008. Cooperative Amphibian Monitoring Protocol for the Greater Yellowstone Network, Natural Resource Report NPS/IMR/GRYN/NRR—2008/00X

WDEQ/WQD. 2004. Manual of Standard Operating Procedures for Sample Collection and Analysis. Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program, Cheyenne, WY

Page 234 – In section A.1, "during one night" should be changed to "fished over one night" and "it is predicted" to "recent modeling predicts".

Page 236 – Section A.4.1, second period in the last line on the page should be deleted.

Page 237 – Section A.4.2, change "longevity, and its ample prey base in Yellowstone Lake" to "longevity and an ample prey base"; change ", their reproductive potential" to ". Their reproductive potential also increases with size."

Page 240 – Section A.5, in the second full paragraph, 3rd line, change "that led to relatively rapid a population" to "leading to a relatively rapid population". In the last full paragraph, 8th line: change "if harvest" to "as harvest" and in next line, remove "be". In

that same paragraph, last sentence, change to: "If suppression efforts could target removal of older females, thereby reducing the mean age of mature females, the population's intrinsic growth rate, and eventually abundance, would also be reduced."

Page 242 – In the first paragraph, first line, change "accepted" to "suggested". In the third line, delete the "are" that follows the "is". The fourth paragraph, beginning "Projected lake trout abundance in Yellowstone...", should be deleted.

Page 243 – In section A.7.1, in the third line, add "of fishing" after "20 weeks".In the fourth line, "0.33" should be "0.30". In the fifth line in the paragraph following Table A-1, change to "Syslo (2010) suggested that to hold the LKT population at its current level (population growth rate of 1.0) a fishing mortality rate of 0.33 would be necessary."

Figure A-2 should not have numbers associated with the Lake Trout Abundance axis.

Page 244 – The second line should have a space after "0.86". The third line should say "mortality rate to 0.56", not "mortality rate by 0.56".

Page 246 – In the first paragraph, first sentence: replace "at least as much" with "similar LKT suppression"; 4th line, delete "t" after "largest"; last line, delete "productive".

In the second paragraph, delete "much" from the seventh line.

Page 272 – Insert paragraph addressing new research (January 2011) and add citation to Appendix 2 Literature Cited

In January, 2011 the journal Environmental Health Perspectives published an article titled "Rotenone, Paraquat and Parkinson's Disease" (Tanner et al. 2011). The article suggests evidence for a link between rotenone exposure and development of Parkinson's Disease (PD) among private pesticide applicators. The study examined pesticide applicators (mostly farmers) and their spouses from Iowa and North Carolina. It found that among members of this group with PD 19% had used rotenone at least once, whereas among members of the group without PD 9% had used rotenone. This provides evidence that a link may exist between rotenone use and PD, but does not provide causal proof that using rotenone leads to PD. It is very important to note that the study examined only private pesticide applicators and their spouses, in other words, individuals likely to come into contact with undiluted pesticide products of all kinds. The article does not provide information on the specific rotenone products users had contact with, degree of training for rotenone use, product formulation (liquid or powder), duration of exposure, personal protective equipment worn during exposure, or other aggravating or mitigating factors affecting exposure. The study identifies among its limitations that most participants were exposed to many pesticides and effects of other agents cannot be excluded, nor can the possibility of results being due to exposure of combinations of pesticides. The study does not specifically address piscicides, beyond the generalization that rotenone is used as a piscicide, or therefore, the specific risks posed by piscicides. It seems unlikely, however, that farmers would routinely be exposed to piscicides and would more likely have been

exposed to agricultural rotenone products no longer registered for use by the EPA. Regardless, this study emphasizes the need to limit human exposure to rotenone through responsible application techniques, training, utilization of PPE, neutralization, and public awareness. Given the treatment, neutralization, and safety procedures outlined in Appendix B we reiterate our conclusion that piscicide application does not represent an unreasonable risk to the environment or human health and safety.

Tanner, C.M., F. Kamel, G.W. Ross, J.A. Hoppin, S.M. Goldman, M. Korell, C. Marras, G.S. Bhudhikanok, M. Kasten, A.R. Chade, K. Comyns, M.B Richards, C. Meng, B. Preistley, H.H. Fernandez, F. Cambi, D.M. Umbach, A. Blair, D.P. Sandler, and J.W. Langston. 2011. Rotenone, Paraquat and Parkinson's Disease. Environmental Health Perspectives; DOI: 10.1289/ehp.1002839

Page 364 – At the top of the page, in the first bullet, change "juvenile amphibians" to "larval amphibians".

Pages 35, 99, 109, 167, 234, and 243 – All references to 7,000 km of fishing effort should be changed to 8,400 km of fishing effort.

RESPONSES TO SUBSTANTIVE COMMENTS
NATIVE FISH CONSERVATION PLAN/ENVIRONMENTAL ASSESSMENT
YELLOWSTONE NATIONAL PARK

Plan Implementation

Concern Statement (1): Climate change and innovative strategies should be addressed to ensure native fish persistence in a changing climate.

Response: *The EA outlines a plan for managing climate change by taking steps such as providing climate refugia, maintaining connectivity of habitats, maintaining healthy and genetically diverse populations, and managing other threats like non-native species (Pages 11-12). The park plans to follow guidance provided by the NPS in the Climate Change Response Strategy (September 2010) aimed at building resiliency and adaptation into native species.*

Concern Statement (2): A new alternative should be developed to address only the removal of LKT from Yellowstone Lake and exclude work in streams, rivers and other lakes.

Response: *The plan goal is to conserve all native fish throughout Yellowstone National Park (Page 1). In order to do this all native fish resources and threats must be considered and if possible addressed. An alternative that considered only Yellowstone Lake would fail to achieve the goal of conservation of native fish throughout Yellowstone.*

Concern Statement (3): The beginning of the timeline for "current management practices" is not correct.

Response: *Past actions did occur prior to this EA, but at limited levels and not from a holistic conservation approach. In 2001 the NPS added the gillnetting boat Freedom to its fleet of vessels working on LKT removal in Yellowstone Lake. This boat greatly expanded the capacity of the NPS to remove LKT and therefore represents the beginning of "current conservation practice levels" (Page 29).*

Concern Statement (4): The effects of wildfire on proposed actions should be considered in the EA.

Response: *Wildfire was considered within the cumulative effects analysis of each applicable impact topic.*

Concern Statement (5): The NPS needs to ensure compliance with the Clean Water Act through the National Pollution Discharge Elimination System permitting process.

Response: *Application of piscicides under the plan would comply with all applicable state and federal laws and permitting processes including NPDES. Piscicide regulation and permitting, including information concerning NPDES, is located in the plan under the "Piscicide Regulation" section of Appendix B (Pages 267-268). Permits required for project*

implementation are disclosed in Table 9 (Page 60, however, NPDES permits were unintentionally omitted but have been added in the Errata Sheets). It should be noted that an ongoing series of court decisions and legislative actions may alter the status of piscicide regulation under the CWA and therefore NPDES and a recent court ruling extended the deadline for compliance from April 11, 2011 to October 31, 2011. Regardless, Yellowstone plans to fully comply with all applicable state and federal laws and permitting processes.

Monitoring, Data Collection & Research

Concern Statement (1): Fish monitoring, wildlife monitoring, and research should be enhanced.

Response: *Monitoring is an integral part of adaptive management and the park has strived to incorporate measurable objectives into this plan (pages 16 and 17; section 2.2, pages 29 – 34). A detailed monitoring plan is currently being developed in cooperation with researchers at Montana Cooperative Fishery Research Unit. (page 43). A science panel review of this work, as well as other progress to date is scheduled for June, 2011. The park will carefully consider recommendations from both of these endeavors and any future reviews, when developing a sound monitoring plan. The NPS does monitor other species which prey on YCT. The park has several wildlife biologists on staff, each with their own areas of responsibilities and monitoring plans.*

Concern Statement (2): More information on monitoring activities should be included and the public availability of this information should be described.

Response: *A brief description of amphibian and aquatic invertebrate monitoring, and associated references, were updated in the Errata Sheets. This monitoring provides information on distribution, life stages, and abundance of amphibian and aquatic invertebrate taxa found within proposed project areas. The data will be used to determine if special status species are present; assist with timing of piscicide application to minimize impacts to non-target organisms, and guide piscicide application within a restoration area. In 2002, a water quality monitoring program was initiated in Yellowstone National Park. These data provide park resource managers with a better understanding of baseline water quality information in park waters. This information will help prevent degradation of water quality during project implementation. Fish monitoring on Yellowstone Lake and other streams and lakes within Yellowstone National Park will help guide native fish restoration projects to inform park managers whether project objectives are being met and if adaptive management principles need to be adjusted. All data collected during monitoring will be kept within the Fisheries and Aquatic Science Program of Yellowstone National Park and is made available through annual reports and other documents.*

Concern Statement (3): Long-term effects of piscicide on natural biodiversity and stream ecosystem function are poorly understood because monitoring is insufficient.

Response: *Amphibian and aquatic invertebrate monitoring within drainages will take place 3 years prior to piscicide treatment and post-treatment surveys will be conducted for*

a minimum of 5 years after treatment to document affects of piscicide on non-target aquatic organisms. Complete recovery of amphibian and aquatic invertebrate communities is expected within this time. However, if complete recovery does not occur within 5 years, monitoring will continue. Additional information concerning amphibian and aquatic invertebrate monitoring has been included in the Errata Sheets. This monitoring will provide information on distribution, life stages, and abundance of amphibian and aquatic invertebrate taxa found within proposed project areas.

Concern Statement (4): Restored fish populations will not be thoroughly monitored.

Response: *Post-piscicide treatment fish monitoring will be conducted at least once every three years to document recovery of native fish populations and assess potential re-invasion by non-native fish. Monitoring success of native fish restoration activities are described within the EA for Yellowstone Lake (pages 41-44) and streams (pages 55-56). The collection of information from captured fish, such as length, weight, and age, would allow population structure, growth rates, and biomass to be estimated (pages 55-56).*

Concern Statement (5): Electrofishing the Lamar River and Soda Butte Creek will not be effective in removing non-native fish.

Response: *Electrofishing streams and rivers is only one method that is used as a mitigating measure to reduce the impacts of non-native fish on native fish. Electrofishing will not be used as a method to completely eradicate fish from complex systems such as the Lamar River and Soda Butte Creek.*

Mechanical Methods

Concern Statement: The full range of desired conditions in streams, rivers, and lakes could be achieved using electrofishing (instead of piscicides) and this option was not fully considered.

Response: *Alternative 4 (2.5; Page 60) and its subsequent analysis in Chapter 4 (4; Pages 92-216) analyzes the use of only mechanical means, and not piscicides, to remove non-native fish from streams, rivers, and lakes. The plan finds that using only mechanical means of removal, including electrofishing, would not accomplish the plan objectives (Table 4; Page 28). This is because electrofishing is unlikely to be effective at completely eradicating non-native fish from habitats large and complex enough to provide native fish with long-term protection from extinction (Appendix B; B.3.1.; Pages 256-260).*

Chemical Methods

Concern Statement (1): Piscicide should be applied during winter immediately before or during the time that lakes are ice covered because it would be effective at removing non-native fish and would mitigate contact of terrestrial predators with fish killed by piscicide.

Response: *Cold water and reduced light intensity, which occur both due to short daylight periods and ice cover, prolong the persistence of piscicide in lakes. For this reason, the plan proposes to apply piscicides during open water periods, usually late-summer, to reduce the*

persistence of piscicides to the greatest extent possible (see Appendix B). The suggestion that winter treatments may mitigate exposure of terrestrial predators to fish killed by piscicides is valid. However, impacts to terrestrial predators would be mitigated by collecting and removing fish killed by piscicide (EA 2.7.4) and because consumption of piscicide-killed fish poses little threat to terrestrial animals (Appendix B; Pages 272-275).

Concern Statement (2): Piscicide applications may be ineffective or may need to be repeated, and restoration projects may fail due to inadequate barriers or illegal reintroduction of non-native fish, or because piscicides may have unintended adverse impacts.

Response: *Piscicides have been proven to be effective for eradicating non-native fish from streams and lakes in locations across the world, including dozens of locations in national parks (Appendix B; Table B-3). While the risk of incomplete kills does exist, the risk is minimized by developing and following sound application plans using proven techniques (Appendix B, pages 266-267). As stated in Appendix B (Page 274) multiple treatments are anticipated and the analysis of impacts from piscicide application considers the cumulative impacts of multiple treatments. Similar to piscicide use, utilizing sound designs for effective fish barriers reduces the potential for re-invasion due to inadequate barriers. Illegal introductions of non-native fish into restored habitats are a significant concern. The plan would utilize public education to reduce inadvertent introduction risks, and increased law enforcement awareness to reduce malicious reintroduction risk. In total, the risks of project failure are outweighed by the certainty that without action non-native fish will continue to expand and native fish will not recover in Yellowstone. Unintended effects of piscicide application are also a significant concern. In Appendix B the plan conducts a thorough review of the available scientific literature concerning piscicide impacts and concludes that given the available information that piscicides "do not pose an unreasonable threat to the environment or human health and safety" (Page 279).*

Concern Statement (3): The use of piscicides alters biodiversity or alters ecosystems.

Response: *The plan proposes to apply piscicides in locations where the presence of non-native fish has already altered natural biodiversity, and therefore ecosystems, through predation, competition, and displacement. Piscicide application is designed to restore natural biodiversity to the systems where it is used. Local temporary impacts to larval amphibians and aquatic invertebrates would occur from piscicide use (Pages 122-131) but the best available science indicates that extirpation of taxa is unlikely and long term impact to native biodiversity would almost certainly not occur (Page 272-275). Following piscicide treatment all species of native fish would be reestablished in the project area.*

Concern Statement (4): The treatment of springs and seeps with piscicide is problematic.

Response: *The method proposed by the plan for the piscicide treatment of springs and seeps is discussed in Appendix B (Page 267) and does not involve pumping piscicide into springs and seeps.*

Concern Statement (5): The piscicide treatment of lakes may be problematic due to difficulty in neutralization, resulting in impacts to wildlife.

Response: *Appendix B provides an extensive discussion of piscicide application to lakes, neutralization of piscicides, environmental persistence of piscicide, and effects of piscicide on aquatic and terrestrial organisms (Pages 260-279). Impacts of piscicide application on aquatic and terrestrial wildlife are provided in Chapter 4 (Pages 122-159).*

Concern Statement (6): The EA failed to disclose prior applications of piscicide in Yellowstone.

Response: *The plan discusses prior use of piscicides in Yellowstone (Page 48) and states that the recent successful treatments of High Lake and the East Fork Specimen Creek will be used as models for future treatments (Page 48). Additionally, the plan summarizes all application of piscicide application for inland salmonid management in national parks, including Yellowstone (Table B-3).*

Concern Statement (7): The EA should consider past studies of piscicide and potassium permanganate persistence in the environment.

Response: *The plan considers the environmental persistence of piscicides and potassium permanganate in the sections of Appendix B titled Piscicide Neutralization, Piscicide Bioaccumulation, and Long-term Environmental Persistence (Pages 276-277). The plan concludes that it is unlikely that either piscicide or potassium permanganate will persist in the environment for a long period.*

Concern Statement (8): The plan should consider impacts to wildlife from ingestion of plants that have come in contact with piscicides.

Response: *The plan considers impacts to terrestrial wildlife through ingestion of piscicide treated water or prey (Page 275) and concludes that piscicides pose little threat to terrestrial wildlife through ingestion.*

Concern Statement (9): The EA should consider the effects of repeated piscicide applications cumulatively and should consider development of piscicide tolerance in target fish.

Response: *The effects of repeated piscicide treatments are considered cumulatively by the EA (Page 274). The EA considers the potential for development of tolerance to piscicide by target fish in Appendix B in the section titled "Development of Tolerance for Piscicide by Fish" (Page 275).*

Concern Statement (10): The plan should consider the downstream effects of piscicide treatments and neutralization and the potential for spills.

Response: *The EA does consider the area downstream of piscicide treatments as part of the impacted treatment area (Page 276) and contains a plan for spills in Appendix C (Piscicide and Potassium Permanganate Emergency and Spill Plan; Pages 288-290).*

Concern Statement (11): The plan does not disclose the effects of piscicides use, techniques, and safety.

Response: *The plan states that the maximum treatment concentration considered would be 50 ppb rotenone (page 274) and all impact analyses from piscicide use are based on that maximum concentration. However, the EA also states that lower concentrations (25 ppb rotenone) would be used if proven effective in removing non-native fish through bio-assays. Throughout the "Chemical Removal of Non-native Fish" section of Appendix B (Pages 260-279) proposed methods for applying piscicide, mitigating piscicide drift, and utilizing personal protective equipment are discussed.*

Concern Statement (12): The plan should include more information regarding all chemicals proposed for use.

Response: *Appendix D of the EA, titled "Material Safety Data Sheets and Product Labels for Fisheries Restoration Chemicals" (Pages 291-338), contains labels and data sheets for all chemical proposed for use in the EA.*

Concern Statement (13): The plan does not incorporate the best available science concerning impacts of piscicides on the human and natural environment. Further the commenter suggests that as the lead federal agency conducting the work, Yellowstone should conduct a review of the environmental effects of piscicide.

Response: *The "Chemical Removal of Non-native Fish" section of Appendix B (Pages 260-279) is a thorough review of the best available science concerning piscicide application, regulation, and effects on the environment. This review represents Yellowstone's independent analysis of potential impacts of piscicides on the environment. It incorporates a broad range of scientific literature, as well as information from piscicide risk assessments conducted by the World Health Organization, American Fisheries Society, U.S. Environmental Protection Agency, State of Washington, U.S. Forest Service, Federal Government of New Zealand, and U.S. National Park Service. References for the source materials used in this assessment can be found on pages 280-287.*

Concern Statement (14): Spills and accidental releases of piscicide beyond the project area are common and that they are not addressed by the plan.

Response: *The EA provides an emergency and spill plan in Appendix C (Pages 288-290). Accidental releases beyond the project area are always due to inadequate neutralization or failure of neutralization equipment. The plan would mitigate the potential for accidental release of piscicide by following the neutralization procedures detailed in Appendix B (Pages 276-277). Under the plan all application of piscicide to flowing waters would include monitored neutralization at the end of the project reach.*

Concern Statement (15): The plan does not thoroughly discuss the environmental effects and efficacy of potassium permanganate.

Response: *Environmental effects of potassium permanganate are similar to those of piscicides. However, potassium permanganate does not travel as far downstream before being naturally oxidized. The application, efficacy, and environmental effects of potassium permanganate are discussed in the "Piscicide Neutralization" section of Appendix B (Pages 276-277).*

Concern Statement (16): The EA does not include a thorough analysis of the effects of piscicide or other native fish conservation actions, discuss history of rotenone application in the park including past success or failure, analyze the efficacy of piscicide, analyze piscicide effects on human health, utilize the best available science concerning piscicide use, or provide details on monitoring organisms affected by piscicide.

Response: *Chapter 4 of the EA provides a thorough analysis of the effects of piscicide application and other native fish conservation techniques on the natural and human environment (Pages 92-216). Further, Appendix B contains a detailed review of current scientific literature concerning the history, use, and impacts to the natural and human environment of piscicide (Pages 260-287). Within Appendix, Table B-3 provides a history, including project success and failures (see also response to AL1040: concern statement 2), of piscicide use for inland salmonid management in Yellowstone and all other National Parks. The EA does state that monitoring fish, invertebrates, and amphibians likely to be impacted by piscicide treatment will be conducted and more detailed monitoring plans for invertebrates and amphibians have been included in the Errata Sheets. These monitoring plans are designed to collect data through the entire period of recovery. Long-term impacts on natural biodiversity and ecosystem function are not anticipated from native fish conservation activities.*

Concern Statement (17): Piscicide treatment will annihilate entire ecosystems and the EA does not fully address these impacts.

Response: *Implementation of this project will not annihilate entire lake and stream ecosystems and will attempt to restore natural biodiversity and ecosystem function to waters compromised by the presence of non-native fish (see response to AL1040; Concern Statement 3). Piscicides are applied only to project waters where non-native fish are present. Within these areas fish and other gill-breathing organisms will be directly affected to varying degrees as described in Chapter 4 (pages 122-141) and Appendix B (pages 260-279). Piscicides will not be applied to connected water where fish are not present, maintaining sources of aquatic organisms to promote recolonization. This and other mitigation measures are described within the EA (page 63). Downstream effects of piscicide will be mitigated by the application of potassium permanganate as a neutralizing agent and the area within the impact from permanganate is considered in the impact analysis. Detailed information about neutralization using potassium permanganate and its*

impacts can be found in Appendix B (Pages276 -277). Objectives of piscicides application and measures of success are described in the EA, page 274.

Cost/Public Funds

Concern Statement: A detailed funding plan for proposed activities should be included in the document or that funding and staffing for project components should be increased, decreased, or obligated for long periods of time.

Response: *The current funding strategy for supporting fisheries and aquatic sciences program activities would continue under the plan's preferred alternative (Alternative 2). This is comprised of diverse funding sources including significant federal and private components. Federal fund sources include base NPS allocations, gate-fee collections, and Yellowstone fishing permit sales. Grant writing to diverse public and private sources also represents an important funding component and would continue. Under the plan Yellowstone would seek to fund the Yellowstone Lake program components at a level adequate to achieve success as defined in Table 5 (Page 32), as well as support individual projects on other streams, rivers, and lakes as possible. Despite the difficulty in predicting future funding, Yellowstone would remain committed to achieving the goals of the plan by seeking funding forming partnerships, and applying the best available science.*

Historically Fishless Waters

Concern Statement: Historically fishless waters that now contain populations of non-native fish should not be considered in conservation actions.

Response: *The plan proposes an approach designed to balance native resources and angling. In the highest value non-native fisheries, the Madison, Firehole, and lower Gibbon rivers, the plan proposes no disturbance of the non-native fisheries. In other park waters where fish were native, the plan proposes to restore historic conditions. Similarly, in waters that were and continue to be fishless the plan proposes to preserve the historic condition. However, in some waters, like the Upper Gibbon River and Goose Lake, that were historically fishless but now contain nonnative fish, the plan proposes to replace them with species that were native to other reaches of the river drainage. In this way, the nonnative threat is reduced, and native fish security and angling opportunities are enhanced. This practice is considered a climate change adaptation strategy for Yellowstone native fishes (see page 11).*

Increase LKT Suppression Efforts & Resources

Concern Statement: Several hundred commenters stated they felt the NPS should increase time and resources dedicated toward LKT suppression.

Response: *One of the main components of the preferred alternative is to substantially increase LKT suppression effort through the use of private contractors. Please see section 2.3.1.1 and 2.3.1.2, pages 35 – 40.*

Make Suppression of LKT Highest Priority

Concern Statement: LKT suppression should take precedence over any other fisheries work conducted in the park. Until the LKT population in Yellowstone Lake is reduced to the point where YCT are able to recover, all other fisheries work especially that which is not time sensitive, should be postponed.

Response: *The response to the Yellowstone LKT invasion is a high priority for Yellowstone National Park and will remain so until the desired conditions prescribed in the Plan have been met and can be maintained. The high priority of this effort has been and will continue to be communicated during potential funding negotiations at all levels, internally and externally.*

Native Fish Restoration Projects – Secondary Priority

Concern Statement: Implementation of projects which, in their view were less time sensitive or less important than LKT in Yellowstone Lake issues, would diminish resources dedicated to restoration of the Yellowstone Lake ecosystem.

Response: *Yellowstone National Park recognizes the importance of restoring the Yellowstone Lake ecosystem by suppression of LKT numbers in order to allow YCT abundance to return to levels seen during the 1980s and 1990s. However, that does not preclude attention to other issues occurring to our fishery resources which must also be addressed in a timely manner. Yellowstone's Resource Management Plan (NPS 1998) identified conservation of stream communities and native cutthroat trout and controlling non-native aquatic species as a high-priority need for the park (see page 18).*

Implement the Recommendations of the Scientific Review Panel

Concern Statement: Many people commented that the recommendations provided by the 2008 science review panel should be implemented.

Response: *Yellowstone National Park is moving towards implementation of many recommendations made by the science review panel; these recommendations were considered extensively when developing Alternative 2, the preferred alternative. Recommendations which are proposed include increased monitoring on both the YCT and LKT populations within Yellowstone Lake, including reconstruction of Clear Creek weir; increased LKT suppression effort through contracted netting (private); review by non-park scientists; and support of additional research such as movement studies (currently proposed by USGS) and alternative lethal tactics which could target embryos (on-going research being conducted by USGS and USFWS).*

Create a Science Review Committee

Concern Statement: One of the recommendations by the review panel convened in August 2008 discussed above was to establish a science review committee to facilitate annual reviews of program direction and effectiveness. Several people specifically mentioned support of this recommendation.

Response: Although the 2008 review panel recommended annual review of the LKT suppression program, the park did not feel enough progress had been achieved along the higher-ranked recommendations (such as increase suppression effort, employ professional netters, identify LKT distribution and movement) to warrant requesting further review. Currently, with the alternatives proposed in this *Native Fish Conservation Plan Environmental Assessment,* completion of a two-year pilot study employing professional netters, completion of research identifying potential benchmarks, and initiation of additional research to monitor and evaluate LKT suppression effectiveness and YCT response, the park feels enough new information is available to warrant further scientific review. As discussed above, the park has invited several of the 2008 panel members to reconvene in June 2011 to evaluate progress to date, revisit the 2008 recommendations, and assist the park in moving forward with using the best available science to guide management of the LKT suppression effort into the foreseeable future. Further, the park proposes to "continue to regularly request science review panel evaluations ... to ensure appropriate direction and ultimate effectiveness of the Yellowstone Lake program" (page 40). This is incorporated into our adaptive management plan (page 31).

Impact Analysis – General

Concern Statement: Impact time frames (short and long-term) for geologic and hydrologic impacts are not defined in the plan.

Response: *Definitions short and long-term impacts are defined in the "Duration" section of each impact topic in Chapter 4 including Geologic Resources (Page 96) and Hydrologic Resources (Wetlands and Waters of the U.S. Page 106).*

Birds, Mammals, and Reptiles

Concern Statement: Piscicide application and other native fish conservation actions would have undisclosed negative impacts on birds, mammals, and reptiles including direct mortality, displacement, and reduction of food sources.

Response: *Activities on Yellowstone Lake are designed to recover historic populations of YCT and restore the fish to their important ecological role. This recovery would benefit terrestrial animals, especially fish eating birds and mammals by restoring a nearly extinct prey species. Lake trout are not readily available to fish eating birds and mammals and their reduction will have little effect on terrestrial wildlife. After removal, LKT carcasses will be disposed of in deep water portions of the lake where they will not become an attractant for bears or other wildlife. No change in wildlife-human interactions is expected as a result of LKT disposition.*

Piscicide treatments are also expected to have little effect on birds, mammals, or reptiles. The extremely low concentrations of piscicide proposed for use (50 parts per billion or less) and the low toxicity of piscicide to terrestrial animals results in almost no chance of toxic effect through drinking or contacting treated water or eating treated prey. Terrestrial wildlife may be affected by temporary displacement during active periods of restoration (barrier construction, piscicide application, and restocking), however this displacement will

be unlikely to exceed several weeks over the course of approximately 5 years. Terrestrial wildlife may also be temporarily displaced due to changes in food availability. This is particularly true of organisms that eat aquatic invertebrates, like the American dipper. Piscicide treatments will temporarily reduce or alter aquatic invertebrate communities and animals that prey on these organisms will need to move to other waters or untreated portions of the drainages to find prey. Effects from this type of displacement are expected to last less than one year following piscicide treatment as aquatic invertebrates recover quickly from the types of piscicide treatments proposed in the plan.

A detailed analysis of the beneficial and adverse impacts of proposed native fish conservation activities on wildlife and other biological resources can be found in Chapter 4 of the EA (Pages 122-159). Under the plan impacts are considered from a parkwide standpoint that considers all potentially impacted wildlife species. A detailed description of Yellowstone National Park mammals, birds, and reptiles can be found in Chapter 3 (Pages 76-80). Long-term monitoring of birds and mammals are conducted by their respective resource groups in the Yellowstone Center for Resources, including in areas where native fish conservation actions will occurs. Coordination with these groups, including reporting of unanticipated direct or indirect impacts to wildlife will occur. If impacts to wildlife are found to exceed those disclosed in the EA activities will stop until impacts can be mitigated. Information concerning the toxicity of piscicides to non-target organisms, including birds, mammals, and reptiles can be found in Appendix B (Pages 272-275).

Amphibians

Concern Statement (1): Amphibians are not included in the Adaptive Management Strategy for Alternatives 2, 3, and 4.

Response: *Adaptive Management Strategy for Alternative 2, 3, and 4 will include best practices to evaluate non-target species which include aquatic invertebrates, amphibians, and non-target fish. Prior to piscicide application aquatic invertebrates and amphibian surveys will be conducted at least 3 years prior to treatment. These concerns have been noted in the Errata Sheets to address this issue.*

Concern Statement (2): The EA fails to mention a mitigation plan to monitor amphibians within project areas.

Response: *These concerns have been addressed and are presented in the section 'Mitigating Measures' (2.7) of the EA and can be found in the Errata Sheets. Amphibian survey records will be housed in a database maintained in Yellowstone National Park, Yellowstone Center for Resources, Fisheries and Aquatic Sciences Program. The term 'juvenile amphibians' has been changed to larval amphibians in EA 2.7.4 page 63 and noted within the Errata Sheets.*

Concern Statement (3): The EA needs to include amphibians when stream survey work is being conducted to ascertain distribution of target and non-target fish.

Response: *Within the EA, page 49 and noted in Errata Sheets, has been revised to include survey work documenting the presence of amphibians encountered while conducting extent of fish survey work.*

Concern Statement (4): Additional information needs to address life history of amphibians and which amphibians are likely to be encountered.

Response: *Additional species information has been noted in the Errata Sheets for the appropriate amphibian groups found in Chapter 3, pages 80-81, and 87. A heading for plains spadefoot toad (page 81) has been noted in the Errata Sheets.*

Concern Statement (5): A description of inventory, monitoring, and research efforts for aquatic organisms including amphibians is needed.

Response: *Mitigation measures in the EA, page 63 and noted in Errata Sheets has been updated to reflect the type of monitoring that will be conducted for amphibians and aquatic invertebrates monitoring within proposed project areas.*

Concern Statement (6): There isn't enough pre-treatment data to allow a full assessment of the project area.

Response: *Survey of aquatic invertebrates and amphibians was added to mitigation measures (page 63 and noted in the Errata Sheets) and will take place at least 3 years prior to treatment (updated EA, page 63) and 5 years post-treatment. Amphibian surveys will continue until populations resemble pre-treatment conditions. Piscicides will not harm adult amphibians (EA pages 272-275) and mitigation measures will be taken to minimize impacts to larval amphibians EA, pages 272-275). Application of piscicides to streams is most often accomplished through a series of metered dispensing stations placed at specified intervals along the streams course (EA, page 266). These stations are operated by 1-2 people. Minimum impacts to riparian areas are expected because each application will be over a short duration (e.g. 1-2 days per year for each treatment). Piscicide application will not cause adverse impacts to adult amphibians, reptiles, birds or mammals (EA pages 272-275).*

Concern Statement (7): Not enough information will be collected regarding amphibian communities within a project area prior to piscicide treatment.

Response: *Survey of amphibians will take place at least 3 years prior to treatment (page 63 and noted in Errata Sheets). Piscicides will not harm adult amphibians (EA pages 272-275) and mitigation measures will be taken to minimize impacts to larval amphibians EA, pages 272-275). Amphibian surveys will include information regarding occupancy and number of adults encountered. Data regarding amphibian health (abnormalities, dead or dying amphibians) will also be collected during surveys. There are no rare or endemic amphibians that reside within Yellowstone.*

Aquatic Macroinvertebrates

Concern Statement (1): Aquatic invertebrates are not included in the Adaptive Management Strategy for Alternatives 2, 3, and 4.

Response: *Adaptive Management Strategy for Alternative 2, 3, and 4 will include best practices to evaluate non-target species which include aquatic invertebrates, amphibians, and non-target fish. Prior to piscicide application aquatic invertebrates and amphibian surveys will be conducted at least 3 years prior to treatment. These concerns have been revised within the mitigation section, page 63, and reflected within the Errata Sheets.*

Concern Statement (2): What will be done with non-insect taxa in areas proposed for rotenone treatment.

Response: *Because gastropods and bivalves are gill breathing, individual organisms may be negatively affected by rotenone and potassium permanganate treatment. However, these organisms are found within the substrate which may limit exposure to piscicides after application. Invertebrate data of non-insect taxa collected after our piscicide treatment of High Lake (2006) showed a positive response with increased densities one year after fish removal. If unique taxa are found within a stream segment proposed for piscicide treatment, they would be collected, housed and provided with untreated water, and released back into the stream after piscicide application and neutralization has been completed.*

Concern Statement (3): Rotenone is toxic to organisms and the park service has failed to assess how piscicides will affect non-target organisms.

Response: *Please refer to Appendix B (pages 272-277) on effects of piscicides and potassium permanganate on non-target wildlife and Appendix B (pages 270-271) on impacts of these chemicals to human health.*

Concern Statement (4): There isn't enough information to completely assess the pre-project conditions of the aquatic invertebrate community.

Response: *This concern has been incorporated into the mitigation measures (EA, page 63) and noted within the Errata Sheets.*

Concern Statement (5): Long-term analysis should be conducted for proposed treated areas to assess overall impacts of chemical application to aquatic invertebrates.

Response: *Inventory and monitoring of stream aquatic invertebrates will follow procedures established by WDEQ/WQD (2004). At least 3 years of pre-treatment data will be collected from areas targeted for fish restoration and 5 years of post-treatment data will be collected. These plans were incorporated into the mitigation measures (EA, page 63) and noted within the Errata Sheets.*

Concern Statement (6): The EA doesn't conduct a full assessment of all species of macroinvertebrates in the project area at all stages of life.

Response: *Piscicide application will be applied directly to the aquatic environment and special care will be taken to reduce piscicide drift into terrestrial areas as described in Appendix B. Therefore, only aquatic species are being assessed. Some adult insects with larval aquatic stages, such as dragonflies and caddisflies, will be captured to obtain species level of identification.*

Concern Statement (7): Piscicide treatment will alter the aquatic invertebrate community so that less sensitive species (flies and midges) will become dominant over more sensitive species (stoneflies, caddisflies, and mayflies).

Response: *As with most disturbances, the aquatic community will likely experience short-term change as less sensitive taxa become more abundant and more sensitive taxa become less abundant. However, it is expected that after the stressor (piscicide) has been removed, the community will recover to pre-treatment conditions as the aquatic invertebrate community dynamics becomes more stable and has been demonstrated from studies by Dinger et al (2006). There have been no USFWS ESA listed aquatic macroinvertebrates found within Yellowstone during 9 years of sampling.*

Dinger E.C., G.A. Haden, and J.C. Marks. 2006. Effects of fish renovation on Fossil Creek aquatic invertebrates using high concentrations of Antimycin A. North American Benthological Society

Concern Statement (8): Piscicide use does not consider toxicity to aquatic invertebrates.

Response: *Inventory and monitoring of stream aquatic invertebrates will follow procedures established by WDEQ/WQD (2004). At least 3 years of pre-treatment data will be collected from areas targeted for fish restoration and 5 years of post-treatment data will be collected. Post-treatment monitoring will continue annually until macroinvertebrate communities have recovered and resemble pre-treatment conditions. These plans have been incorporated into the EA, page 63, section 2.7.4. Additional information regarding piscicide on non-target organisms can be found within the EA, pages 272-275.*

Microorganisms

Concern Statement: The plan doesn't thoroughly analyze impacts to microorganisms within the project area.

Response: *Microorganisms play an important part in ecological processes of terrestrial and aquatic systems. However, no information could be found detailing the impacts of piscicide on microorganisms. Therefore, we consider impacts to microorganisms likely to be similar to impacts to invertebrates. That is, microorganisms likely exhibit a wide range of susceptibility to piscicide treatments with some being highly susceptible and others being completely tolerant. Like aquatic invertebrate communities, we believe that microorganismal communities will be affected in the short-term following piscicide*

treatment but will recover within 1 year post-treatment. Further, given the immense diversity of microorganisms and the extraordinarily dynamic nature of their communities identifying every species within any given project area at any given time would be essentially impossible. It should also be considered that since piscicides primarily affect gill-breathing organisms and microorganisms are not gill-breathing, they may be less susceptible as a group than aquatic invertebrates.

Plants

Concern Statement: The toxicity of rotenone to aquatic plants and conducting plant surveys within the project area.

Response: *Affects of piscicides on plants is described in Appendix B of the EA (page 275). Each site would be surveyed for rare plant species, cultural resources, and wetlands before implementation for projects on a case by case basis (EA, page 62).*

Special Status Species

Concern Statement (1): Fish barriers will have negative impacts on special status aquatic and amphibian species.

Response: *Fish barriers are designed to protect pure strains of native fish (after fish restoration) from upstream movement of non-native or hybridized fish. This will assure the overall genetic integrity and persistence of native fishes within a drainage. Only one species of aquatic invertebrates, with special status listing, has been documented in Yellowstone and is not a species listed under the USFWS Endangered Species Act. This species has only been found in one location and inhabits cool, rocky springheads which are not suitable sites for barrier construction (EA, page 87). In Yellowstone, amphibian species generally breed in stagnate or calm water and do not breed in fast flowing stream habitats (EA, pages 80-81). Adult amphibians are highly mobile and capable of moving long distances. They would not be impeded by a constructed barrier. The Clear Creek weir will be designed in such a manner that it will only temporarily impede YCT spawning migration during times of active operation. During operation, YCT will be counted as they pass the weir or briefly captured so that data can be collected from them. However, fish that encounter the weir will be quickly allowed to continue their up or down stream migrations.*

Concern Statement (2): Chemical treatments will harm special status fish, macroinvertebrate, and amphibian species with project implementation.

Response: *Areas proposed for chemical treatment contain non-native or hybridized fish populations and therefore would not qualify as a special status species. Larval Alexander's Rhyacophilan Caddisfly are only known to be found in very specific habitat (springheads) which is less likely to receive chemical treatment, however, this species was first discovered in Yellowstone following a piscicide treatment that included the lake-side spring where it was found. Columbia spotted frogs are the only amphibian special status species in Yellowstone. For the past 3-5 years amphibian breeding surveys have been conducted in areas proposed for fish restoration. Most existing breeding sites are not hydrologically connected to waters that contain fish and would not be treated by chemicals thus avoiding*

impacts to larval amphibians. Even in the event that a site where Columbia spotted frog tadpoles are present during a piscicide treatment, recovery of the population is expected to occur the following year. For example, the number of Columbia spotted frogs in High Lake increased dramatically the year following the 2006 treatment of the lake.

Concern Statement (3): The EA doesn't provide sufficient surveys of the project area to evaluate the presence of endangered, threatened, or sensitive species.

Response: *Aquatic invertebrate and amphibian surveys will be conducted 3 years prior to treatment following standard protocols. This information has been added to mitigation measures within the EA (page 63) and noted in the Errata Sheets. Each project site would be surveyed for rare plants before barrier construction (EA, page 62). Additional mitigation measures are outlined within the EA (pages 62-63). A complete analysis of environmental consequences for special status species is discussed within the EA (pages 159-169). The project area for the plan is defined as Yellowstone National Park and therefore all special status species in Yellowstone are considered in the affected environment (Pages 82-88).*

Fish

Concern Statement (1): The Adaptive Management Strategy should be expanded to include non-target native fish species.

Response: *Adaptive Management Strategy for Alternative 2, 3, and 4 will include best practices to evaluate non-target species which include aquatic invertebrates, amphibians, and non-target fish. Prior to piscicide application aquatic invertebrates and amphibian surveys will be conducted at least 3 years prior to treatment. These concerns have been revised within the EA (page 31) and noted in the Errata Sheets to address this issue.*

Concern Statement (2): Native non-game fish are not discussed in the restoration of native fish into a watershed.

Response: *This concern has been addressed and has been updated in the Errata Sheets. This plan is designed to benefit all native fish species in Yellowstone, not just those considered "sport fish". The plan excludes native fish conservation actions on the Firehole, Madison, and lower Gibbon rivers, a discussion of the decision making process for inclusion or exclusion of specific waters can be found in the response to NA1000.*

Concern Statement (3): NPS has not assessed how the chemicals used for fish restoration will impact non-target organisms including fish.

Response: *Affects of piscicides on humans and other non-target organism are discussed in Chapter 4 (Pages 92-216) and Appendix B of the EA (pages 270-275). Tolerance of piscicides by fish is discussed in Appendix B of the EA (pages 262 and 275).*

Concern Statement (4): Current presence, and potentially foreseeable stocking, of non-native fish could jeopardize the success restoring native fishes in Yellowstone National Park.

Response: *Past and present stocking of non-native fish species has led to the current management concern of preserving native fish species in Yellowstone. NPS Management Policy 4.4.4.1 (2006) directs the Service that non-native species will not be introduced into parks. NPS Management Policy 4.4.4.2 (2006) also directs the Service that non-native species will be "managed-up to and including eradication – if (1) control is prudent and feasible, and (2) the exotic species interferes with natural processes and the perpetuation of natural feature, native species or natural habitats, or disrupts the genetic integrity of native species. Non-native and hybridized fish will be isolated from restored areas by the construction/modification of fish barriers. Environmental impacts to fish species (including cumulative impacts) are discussed in Chapter 4 of the EA (pages 131-141).*

Wetlands

Concern Statement: Several comments state that the plan will have unacceptable impacts on wetlands.

Response: *NPS will comply with the Section 404 of the Clean Water Act and complete all the necessary permits required for individual fish restoration projects. Director's Order #77-1 requires that the NPS will employ a sequence of a) avoiding adverse wetland impacts that could not be avoided, b) minimize impacts that could not be avoided, and c) compensate for remaining unavoidable adverse wetland impacts via restoration of degraded wetlands. For a full disclosure of projected impacts to wetlands from specific native fish restoration activities, please refer to Appendix G: Statement of Findings for Wetland Protection within the EA (pages 345-379).*

Water Quality

Concern Statement (1): The document does not specify permitting of the piscicide under the Clean Water Act and the construction of weirs, fish barriers, and reconnecting streams could further degrade water quality.

Response: *Anticipated permitting is outlined in Table 9 of EA, page 60. Permit application for the use of piscicides in targets streams is discussed within the EA (Appendix B, pages 267-268). Permitting under the National Pollution Discharge Elimination System of the Clean Water Act is addressed in the response to AL1000; Concern Statement 6. Impacts of weirs, fish barriers and reconnecting streams on Yellowstone Lake and how it relates to wetlands is discussed in EA (Appendix G, pages 345-379).*

Concern Statement (2): Chemical application of rotenone will impact water quality and safety for human consumption.

Response: *The statement within the EA states "A concentration of 10 ppb is about 1,750 times less than the level determined by the Montana Department of Environmental Quality to be safe for long-term human consumption and 175,000 times less than the safe level for short-term consumption" (page 119). This means that concentration of rotenone proposed for use is vastly lower than the amount estimated to be safe for human consumption by the Montana Department of Environmental Quality.*

Concern Statement (3): The EA doesn't present analysis of pre-treatment water quality information on the projects that will receive piscicides.

Response: *The NPS has been collecting water chemistry information on major surface waters in Yellowstone National Park since 2006. Stream water quality will be tested during low flow conditions before and after any piscicide application. Parameters to be collected include major anions, cations, and nutrients.*

Concern Statement (4): The project should include post-treatment monitoring to determine the effects of chemicals on organisms and soils.

Response: *Water quality monitoring will be conducted before, during, and after piscicide application and tested for the presence of rotenone or Antimycin. It is not anticipated that rotenone or Antimycin will be persistent within the environment. Please refer to Appendix B within the EA (pages 274-275) for a description of effects of piscicide and potassium permanganate on long-term persistence and bioaccumulation in the environment. Treatment periods will be short in duration and bird and mammal communities will not have long-term impacts (displacement) from piscicide application.*

Human Health & Safety

Concern Statement (1): The EA did not thoroughly assess the effects of rotenone and potassium permanganate on people.

Response: *An analysis of the effects of piscicide on human health and safety can be found in Chapter 4 of the EA (Pages 175-177). Additionally, Appendix B of the EA (pages 270-272, 276-277) describes the effects of rotenone and potassium permanganate on people, including risks associated with Huntington's and Parkinson's disease. Information concerning a recent scientific publication on rotenone and Parkinson's Disease is included in the Errata Sheets.*

Concern Statement (2): The presence of buoys on Yellowstone Lake presents a boating hazard to boaters.

Response: *Buoys are marked to provide identification on net placement and to warn boaters of potential danger. NPS uses yellow flagging to make them highly visible to the public. However, most nets are placed in deep water making it unlikely that they could become entangled in motor propellers.*

Concern Statement (3): Buoys marking net locations on Yellowstone Lake should be made more visible.

Response: *The park currently places buoy markers at each end of each net to ensure they are easily seen by boaters and fisherman. Buoys are constructed of 6-ft lengths of conduit with a weighted end to hold them upright, bullet-type floats in the middle to keep them afloat, and a bright yellow flag attached to the top to increase visibility. In*

determining the most appropriate construction of these buoys, the park took viewshed impairment, public safety, and program efficiency under consideration and determined yellow flags would be most appropriate. They are clearly visible when in close proximity but not so bright as to impair visitor viewsheds from a distance.

Habitat Alterations

Concern Statement (1): The primary reason native fishes have been lost in Yellowstone is because of fish habitat that should be restored.

Response: *It is true that degraded habitat can bring about the decline of environmentally sensitive species. However, in Yellowstone, these stressors are not a factor in native fish species decline because watersheds remain nearly intact with little (if any) impairment to water quality and quantity. Also, riparian areas remain intact and minimal impacts from stream channelization, dam construction, and overgrazing of watersheds occur. In Yellowstone the primary stressor that has contributed to native fish decline is competition, predation, and hybridization from introduced fish species. The goal of the current native fish restoration plan is to remove and isolate non-native fish species from select stream reaches and return species native to those drainages.*

Concern Statement (2): The EA hasn't fully assessed the project area and region.

Response: *Most streams and rivers within Yellowstone originate within park boundaries; therefore other activities that could possibly occur within a watershed would be minimal because degrading activities are not permited, The EA defines the project area as Yellowstone National Park and addresses environmental impacts accordingly. Chapter 4 (pages 92-216) of the EA fully outlines impacts from project implementation to various components of the surrounding environment. Appendix G of the EA (345-379) further explains potential impacts to wetland areas and EA pages 61-63 outline mitigation measures that will be taken during implementation of the various projects.*

Lake Trout Suppression – New Alternative – EA

Concern Statement (1): The park should stock additional non-native fish species into Yellowstone Lake with the hopes the new specie(s) would reduce juvenile LKT survival through predation and competition and provide an additional prey resource for the adult LKT, thereby reducing predation on the native YCT.

Response: *Past fisheries practices, particularly in reservoirs, have often used a variety of stocking strategies to achieve desired management objectives. However, the goal of this plan is restoration of native fishes to park waters. The introduction of one or more additional non-native fish into the ecosystem would be counter to NPS policy and is therefore not an action the park is willing to undertake. This action was considered but dismissed, as discussed on page 64 of the EA.*

Concern Statement (2): Pheromones have been used to attract lamprey in the Great Lakes Region and possibly could be used to enhance LKT suppression in Yellowstone Lake.

Response: *This was a topic for discussion brought to the science panel which convened in August 2008. At this time, use of pheromones to attract LKT to areas where they could be easily captured and removed is not a viable option (Gresswell 2009).*

Concern Statement (3): Electrofishing, although proven effective, is no longer being used to remove adult LKT from spawning areas.

Response: *The Park has previously used boat-mounted electrofishing to remove LKT from spawning areas. Concerns regarding crew safety led to the park discontinuing this method of LKT suppression.*

Concern Statement (4): The park should establish a sanctuary for cutthroat trout rather than attempt to preserve or restore them in their natural habitat. A sanctuary could be built within their natural habitat and enlarged over time.

Response: *The technology does not currently exist to isolate large areas of Yellowstone Lake for purposes of creating YCT refuge from LKT.*

Concern Statement (5): Non-native LKT in other parts of Yellowstone outside of Yellowstone Lake should be eliminated.

Response: *Lewis and Shoshone lakes, historically fishless, were stocked with LKT in 1890. Since that time LKT have emigrated to and become established in Heart and other downstream lakes. Removing LKT populations outside of Yellowstone Lake is not currently practical, would detract from other more pressing native fish issues, and would diminish angling opportunities. For a more in-depth discussion please refer to page 64 of the EA.*

Concern Statement (6): The park should initiate a hatchery operation and stock cutthroat trout into Yellowstone Lake to attempt to increase YCT abundance.

Response: *Large scale YCT supplementation in Yellowstone Lake is discussed under Section 2.8 Alternatives Dismissed from Further Analysis (page 66).*

Concern Statement (7): The potential of LKT to pioneer new waters should be addressed.

Response: *Lake trout can move from one lake system to another using connecting tributaries and rivers. However, they are a lake-dwelling species and are not likely to become established outside of a lake system. No large lakes with habitat suitable to support LKT occur in the connected waters to Yellowstone Lake.*

Concern Statement (8): Supplement the YCT population by planting eggs in the Yellowstone River downstream of the lake.

Response: *This suggestion is included in one of the proposed conservation actions: "Reintroduce YCT Embryos to Former Spawning Streams", presented on page 41. Although not specifically mentioned as a spawning tributary, YCT spawning does occur in*

Yellowstone River. If this course of action is determined to be necessary, number and location of sites will be chosen based on number of available eggs, accessibility, and probability of success. See section 2.3.1.2, page 41 for more details.

Lake Trout Suppression – Concern – EA

Concern Statement (1): LKT suppression could be more effective and possibly less costly if done entirely through contracting to the private sector and eliminating NPS suppression efforts.

Response: *A cost comparison was performed, and despite having fewer crew members, the contracted LKT suppression effort is more costly than that conducted by NPS crews (for comparable catches of LKT). What the contractors can provide that the NPS crews cannot, however, include their expertise and their ability to fish using additional techniques and gear types, such as deep-water trap nets, which NPS crews and boats are not equipped to handle. Plans for future incorporation of contracted netters, length of time they will fish, and gear types used are dependent on most recent results, scientific review, and resources available.*

Concern Statement (2): Concern was expressed that direct impacts of LKT suppression if increased as proposed would cause more harm than good to the YCT population within the lake . Put more emphasis on the live entrapment gear (trap nets) used in 2010.

Response: *Over the past 10 years, NPS netting effort has incidentally caught 33,900 YCT, 20,100 of which were released live back to the lake and 13,800 were known to have died from gillnetting. During those same 10 years, NPS netting effort removed 515,400 LKT from the Yellowstone Lake population. That equates to 6.6 YCT captured and at least 2.3 YCT killed per every 100 LKT removed. See section 2.7.1, page 61 for more details on mitigation measures to continue to minimize incidental catch of YCT during LKT suppression efforts.*

Concern Statement (3): Modify netting strategies to cause maximum population decrease with the amount of effort used.

Response: *NPS netting effort (NPS as well as contracted) is conducted as was suggested. Larger LKT are most vulnerable during spawning season, when, indeed they are more active and found in more dense aggregations, preparing to spawn. Currently there are five suspected and two known spawning areas in Yellowstone Lake. Special effort is made to target these areas heavily as spawning season approaches in order to maximize adult catch. For additional details see sections 1.3.4, 1.3.5, and A.4.3 (pages 8-9, and 237).*

Concern Statement (4): No evidence exists that LKT extirpation can be accomplished through gillnetting.

Response: *It is not be necessary to completely eradicate LKT from Yellowstone Lake in order for YCT to recover. See section A.6, pages 241 through 247 for more details. More recent reports on suppression success and resultant species recoveries have been released*

since the publication of this document. In particular, work done on Lake Pend Oreille, Idaho and Swan Lake, Montana continue to show promise. For current information on those projects please refer to the Idaho Department of Fish and Game, Coeur D'Alene, Idaho and Montana Fish Wildlife and Parks, Kalispell, Montana.

Concern Statement (5): Make the use of introduction of YCT eggs into appropriate tributaries an immediate priority.

Response: *Stocking YCT from a hatchery source may compromise the natural genetic diversity of the remaining YCT in Yellowstone Lake. Science partners have suggested the park first reduce abundance of LKT and allow for natural YCT recruitment, prior to any artificial supplementation. The park intends to follow this guidance.*

Concern Statement (6): LKT co-exist with cutthroat trout in other systems. In these and in Yellowstone Lake, all populations are healthy so there is no need to reduce the LKT population.

Response: *It has been widely documented that introductions of LKT into cutthroat trout waters have led to at best, notable declines and at worst, extirpation of the native cutthroat trout populations. For more details and an excellent review of much of the current work in this arena, please refer to Martinez et al. 2009. Regarding the YCT population specific to Yellowstone Lake, while individual fish may be very healthy, the population is clearly not. The population has exhibited a precipitous decline since the late 1990s and recent monitoring indicates record or near-record lows in lake-wide abundance and in number of adults ascending spawning streams. These data represent a population which is far from being healthy. Please refer to Section 1.3.6, pages 9 and 10, for additional details.*

Concern Statement (7): Reasons other than LKT predation were the leading cause for the decline in YCT in Yellowstone Lake.

Response: *Certainly factors other than LKT, have affected the health of the YCT population. Please see Section 1.2 (pages 4-6) for more information concerning some of these factors, including whirling disease and drought. Although fires within the Yellowstone Lake ecosystem have caused significant changes to the landscape, it is not likely they have caused significant losses to the overall YCT population within the lake.*

Lake Trout Suppression – Fish Disposition – EA

Concern Statement (1): Concern was expressed regarding the disposition of the nutrients contained in the LKT carcasses.

Response: *Investigation into nutrient cycling within Yellowstone Lake indicates it is a nitrogen-limited system, meaning the amount of nitrogen present in the water is the limiting factor in lake productivity. Modeling the nitrogen budget for the lake indicates nitrogen added to the system by decaying LKT carcasses is minimal compared to the overall lake nitrogen budget. This is discussed under sections 1.11.1 Environmental Topics and*

Resources (pages 22 and 23) and in the Impacts on Water Quality and Quantity Resources sections for each alternative: 4.2.3.1 Alternative 1 (No Action), page 115; 4.2.3.2 Alternative 2, page 118; 4.2.3.3 Alternative 3, page 120; and 4.2.3.4 Alternative 4, page 121. Discarding fish carcasses into deep areas of the lake is an efficient method of handling the carcasses and appears to cause negligible impacts to the lake. For these reasons, this was selected as the preferred method of disposing of fish carcasses handled during suppression efforts.

Concern Statement (2): Investigate the potential of selling, marketing, or donating LKT carcasses for human consumption.

Response: It is the intent of the NPS that the chosen alternative would meet all applicable laws, regulations and policies. Because the donation of fish was being considered under Alternative 3 as well, the NPS did consider this to be a potential alternative, but it is not the preferred alternative.

Include or Exclude Specific Waters from Consideration

Concern Statement: Some waters should be excluded from the plan.

Response: *The decision making process regarding specific waters selected for inclusion or exclusion in the plan is based on conservation value, resources, and likelihood of success (Page 45) as well as an attempt to balance visitor experience with native fish conservation. In general, larger waters provide greater conservation value because they are able to resist negative impacts from events like drought, wildfire, and climate change and they provide resilient refuges for native fish populations. Some species, like AGY require large habitats to sustain populations. However, larger systems are also more difficult to achieve to conservation goals in because habitat complexity and logistical constrains increase the difficulty of removing non-native fish. In the case of the upper Gibbon River the large amount of habitat present represents great conservation value. At the same time, the series of barriers present in the system (Virginia Cascades, Little Gibbon Falls, and Gibbon Falls) lend logistical feasibility to potential actions. The combination of conservation value and logistical feasibility represent an unparalleled opportunity for native fish conservation in Yellowstone. In fact, the upper Gibbon River is one of only two potential candidates for AGY recovery efforts in the park.*

Another high priority conservation action is preserving the few remaining existing populations of native fish. In the case of Trout Lake, the presence of non-native RBT presents a threat to the persistence of a historic YCT population, despite the fact that it appears the two species have coexisted in the lake for generations. The current plan proposes to remove only the RBT from Trout Lake, thus ensuring the preservation of the historic YCT population. It is important to note that the process of hybridization, once begun, is irreversible and that the current status of Trout Lake in no way guarantees that hybridization will not occur in the future. The only reliable way to ensure that the historic Trout Lake YCT population does not become hybridized is to completely remove RBT from the lake.

Native Fish Restoration – Measurable Targets and Projects - EA

Concern Statement: Strive to meet measurable objectives for the conservation of YCT, WCT, and/or GRY.

Response: *The plan defines measurable objectives for native fish conservation actions in Yellowstone Lake (Table 5; Page 32) and streams, rivers and lakes other than Yellowstone Lake (Table 6; Page 33) and proposed measures to meet those targets (Chapter 2; Pages 25-69).*

Native Fish Restoration - New Alternative - EA

Concern Statement: Specific native fish conservation techniques including dewatering streams to remove non-native fish, fish weirs and traps, and creation and utilization of wild brood sources should be employed.

Response: *The EA recognizes that complete dewatering is a viable method of non-native fish removal (Page 263). However, the technique is not proposed for use because impacts to non-target organism would likely exceed that of piscicide use and the method would not be logistically feasible in most locations in Yellowstone. The plan does propose the use of weirs and fish traps to control non-native fish (Pages 53-54 and 258-260). The creation and utilization of wild brood stocks of native fish is proposed in the EA and a discussion of the advantages and disadvantages of wild versus hatchery brood stocks is provided (Pages 49-52).*

Native Fish Restoration - Concern - EA

Concern Statement (1): Reconstruction of the Clear Creek Weir should be a high priority and should have been included under Alternative 1.

Response: *The reconstruction of the weir and fish trap on Clear Creek is a high priority YCT conservation action and is thus included in the Preferred Alternative (Alternative 2; Pages 43-44). Inclusion of the project under Alternative 1 would be inappropriate because reconstruction would require significant changes to the design and construction materials used in the former structure. These changes would result in a structure that may resemble the former weir but would not be identical to it. This is necessary because inadequacies in previous designs led to operational deficiencies, alterations to stream bank morphology, and ultimately failure of the structure in 2008.*

Concern Statement (2): Manually reconnecting tributaries to Yellowstone Lake and using incubators to reestablish YCT in those tributaries should be removed from consideration

Response: *The disconnection of tributaries around Yellowstone Lake typically occurs in late summer, after adult YCT have ascended tributaries to spawn and returned to the lake but before newly hatched YCT fry can escape into the lake. Thus, the disconnect strands YCT fry in the tributaries where they likely perish during winter. Global climate change has begun to alter natural hydrologic processes including the timing and intensity of spring runoff. The plan considers the persistent disconnection of many tributaries, including but not limited to Arnica, Bridge, Columbine, Hatchery, Little Thumb, and Lodge creeks, to be*

due, in part, to changing climate and unnatural limnological processes. Thus, the proposal to manually reconnect tributaries to Yellowstone Lake is designed to build climate change adaptation and resiliency into YCT. This is consistent with the 2010 NPS Climate Change Response Strategy. Regardless of the reason for tributary disconnect, the result is that the disconnect of Yellowstone Lake tributaries in late summer inhibits YCT's ability to recover from other stressors like LKT. The use of Remote Site Incubators to recover YCT runs in Yellowstone Lake tributaries is only proposed in the case that LKT are effectively controlled and YCT do not naturally recover in historic spawning tributaries.

Concern Statement (3): The phrase "100% native alleles" for WCT is not defined.

Response: *Native alleles are those belonging to a species or subspecies of fish native to the drainage in which the fish were historically found. Therefore, waters containing 100% native alleles are those that contain only genes from the species native to drainage in which the water lies. The WCT of Last Chance Creek are considered aboriginal because they occur in a drainage that has been artificially isolated from Grayling Creek which historically contained WCT, they show no evidence of hybridization despite extensive RBT and YCT hybridization in Grayling Creek, no record of stocking exists for Last Chance Creek or any unnamed tributaries of Grayling Creek, and the reach of Grayling Creek that was stocked with WCT in 1980 was stocked during August, a time when Last Chance Creek is dry for over a mile upstream of the Grayling Creek confluence. These factors make it extremely unlikely that the WCT of Grayling Creek were planted there in 1980 or at any other time and provides strong evidence that they are aboriginal. The restoration of WCT to the East Fork Specimen Creek, including establishment of the species in High Lake was discussed extensively in a 2006 Environmental Assessment (Koel and York 2006). The implementation of that EA has led to a naturally reproducing population of 100% WCT alleles in High Lake.*

Concern Statement (4): The park should utilize the best available science to restore native fish to streams.

Response: *The plan discusses the best available scientific approaches to conserving native fish in streams in the Conservation Actions section of Chapter 2 (Pages 47-56) including selection of brood sources and means for assessing genetic composition. Detailed scientific information concerning the control and removal of non-native fish is provided in Appendices 1 and 2 (Pages 233-286). The NPS plans to continue to incorporate new science into the plan's ADM strategy to meet the stated conservation goals (Page 16).*

Fishing Regulations

Concern Statement: Changes should be made to fishing regulations and/or enforcement.

Response: *Changes to angling regulations undergo separate review outside of this document. However, on page 53 a general discussion of recent and potential future changes to angling regulations which could be employed to assist with management objectives is presented. Enforcement of angling regulations is also outside the scope of this document.*

NEPA Process & Issues - General Comments (Adaptive Management & NEPA)

Concern Statement (1): Project descriptions for restoration activities as described under the adaptive management framework are not adequate.

Response: *The plan is programmatic, encompassing the entire park and all of its native fisheries management issues, because non-native fish have and continue to expand their range and adverse influence on native fish across Yellowstone. Areas proposed for conservation actions are those where natural biodiversity and ecosystem function have already been compromised by the presence of non-native species. Pre-project assessments of aquatic ecosystems in these areas can only reveal the status of an already altered system. However, pre-project surveys and monitoring are an important component of the proposed activities (see Errata Sheets). The EA fulfills the requirements of NEPA by defining the project area as Yellowstone National Park, excluding a few specific waters, and disclosing impacts from proposed actions on all affected park resources (Chapter 4; Pages 92-216). Additionally, the EA includes project specific impacts on individual potential projects in Appendix G (Pages 345-379) as an NPS Wetlands Statement of Findings (WSOF). Additional NEPA documentation would only occur if projects were proposed that fell outside of the current scope of the current plan or had impacts exceeding those defined in the plan.*

Concern Statement (2): An Environmental Impact Statement needs to be prepared or provide a more detailed project plan for the first few years of effort.

Response: *Chapter 4 of the EA (Pages 92-216) found that the preferred alternative would result in no impacts exceeding moderate and comment analysis revealed that the proposed actions are not highly controversial; therefore an Environmental Impact Statement is not warranted. The plan does provide a detailed adaptive management framework including performance metrics for proposed actions in Tables 5 and 6 (Pages 32 and 33). The unpredictability of future funding from both federal and private sources make detailed long-term fiscal planning impractical (see response to CO1000), however the NPS remains committed to achieving success in native fish conservation actions.*

Public Involvement in Native Fish Conservation Efforts

Concern Statement: Public (volunteer) involvement in native fish conservation efforts, including angler incentives to remove nonnative fish should be increased.

Response: *Although helpful in other systems, several reasons make the use of angler incentives not practical in the Yellowstone Lake ecosystem. For a more detailed discussion see section 2.8, page 65. Use of angling and angling regulations as a potential action is discussed in section 2.3.2.2 on page 53. Volunteer anglers have been used for park management purposes in the past, and likely will be in the future, but within current regulations. Changes to angling regulations are outside the scope of this document. However, a general discussion of recent and potential future changes to angling regulations which could be employed to assist with management objectives is presented on page 53.*

Public Awareness & Education

Concern Statement: The public should be kept informed about aquatic invasive species.

Response: *The park considers visitor and public education to be an integral part of completing its mission. Interpretive staff parkwide receive annual training to stay abreast of ongoing park issues and fisheries staff members regularly present current fisheries issues at these trainings. Regarding notifying the public of the use of poisons in the park, signage will be posted along any impacted waters when poisons are in use. Also, as is written on page 270 (section B.3.2.1) "Regardless of label guidance, public awareness is the most important means of limiting piscicide risk to human health. Under this EA, park staff would use press releases, signage, and neutralization following treatment of project waters ... to reduce the risk of public contact with the chemicals."*

Regarding aquatic invasive species, the park recognizes that public education is our most important method of prevention and important in protecting the health of our aquatic systems. However, as noted on page 64, "a considerable amount of outreach is available through the park's backcountry offices and visitor centers. Thus this issue was considered to be beyond the scope of this document.

Socioeconomics - Impact of Proposal and Alternatives

Concern Statement: Socioeconomic impacts would occur to surrounding communities if removal of brown trout in the Gibbon River took place the YCT in Yellowstone Lake were lost.

Response: *As an adaptation to climate change, nonnative fish in the upper Gibbon River would be replaced with fish that are native to the drainage in downstream reaches, including westslope cutthroat trout and fluvial Arctic grayling. As there will be no permanent loss of a fishery by this conservation action, no adverse impact to the socioeconomics of surrounding communities is expected. Long term impacts of native fish recovery in headwater streams and on Yellowstone Lake will be beneficial. Refer to pages 180-189 of the EA for a full analysis on impacts to socioeconomics.*

Tribal Involvement

Concern Statement: Lake trout carcasses could be given to local Native American interests.

Response: *Tribes have the opportunity to compete for LKT suppression contracts as part of the government contracting process. Donating or selling LKT carcasses is discussed under Alternative 3 and evaluated in chapter 4 of the EA.*

Visitor Experience - Impact of Proposal and Alternatives

Concern Statement: Visitor use and experience will be adversely affected if actions are not taken more quickly, such as stocking of YCT.

Response: *As part of the adaptive management framework, enhancement of YCT*

recruitment through streamside incubators would be considered when the population stressors (LKT predation and possibly competition) to the YCT population have been sufficiently reduced to allow YCT recovery (page 41). Undertaking these actions prior to that point is not likely to "speed up" YCT recovery and would not impact visitor use and experience.

Visitor Use - Impacts of Proposal and Alternatives

Concern Statement: Visitor use and angling will be adversely affected in an area when a fish removal project is being implemented.

Response: *Moderate impacts to visitor use and angling from non-native fish removal are anticipated under the preferred alternative (Page 204) and would last until native fish are restocked (1-2 years). However, following restocking, diversity of angling opportunities in Yellowstone would increase. Park visitors, including backcountry users, would be informed of fish removal projects through press releases and signage (Page 270). Additionally, parties reserving backcountry campsites in the vicinity of project areas would be advised of the activities and their potential impacts by the Yellowstone Backcountry Office during the reservation process. A map of current NPS netting areas is provided in the Lake Marina Visitor Center and is updated weekly during the gillnetting season.*

Whirling Disease & ANS - General Comment

Concern Statement: Whirling Disease and other diseases and Aquatic Nuisance Species should be more thoroughly addressed in the plan.

Response: *Whirling Disease, other aquatic diseases, and Aquatic Nuisance Species are a significant concern not only for Yellowstone's native fish but for all native aquatic organisms. We recognize that spread of existing diseases represents an import threat to park ecosystems. As such, Yellowstone has developed extensive publicly available information, as well as policies, to address the control and expansion of ANS. Therefore, ANS are not considered in the scope of this document (Page 64).*

Wilderness - Impact of Proposal and Alternatives

Concern Statement (1): Motorized boats would not disturb wildlife on Yellowstone Lake and near the lake shore.

Response: *The presence of motorized boats will likely cause minor disturbances to wildlife on Yellowstone Lake and near shoreline areas. These disturbances are likely to be subtle and could include wildlife to move away from motorized boats, dive, or take flight. Wildlife near the lake shore could temporarily leave the area or move further from the shoreline. Our native fish restoration efforts on Yellowstone Lake are not expected to permanently displace wildlife or interfere with nesting of breeding birds in the area.*

Concern Statement (2): Parts of Yellowstone Lake are restricted and cannot legally be used by propelled vessels.

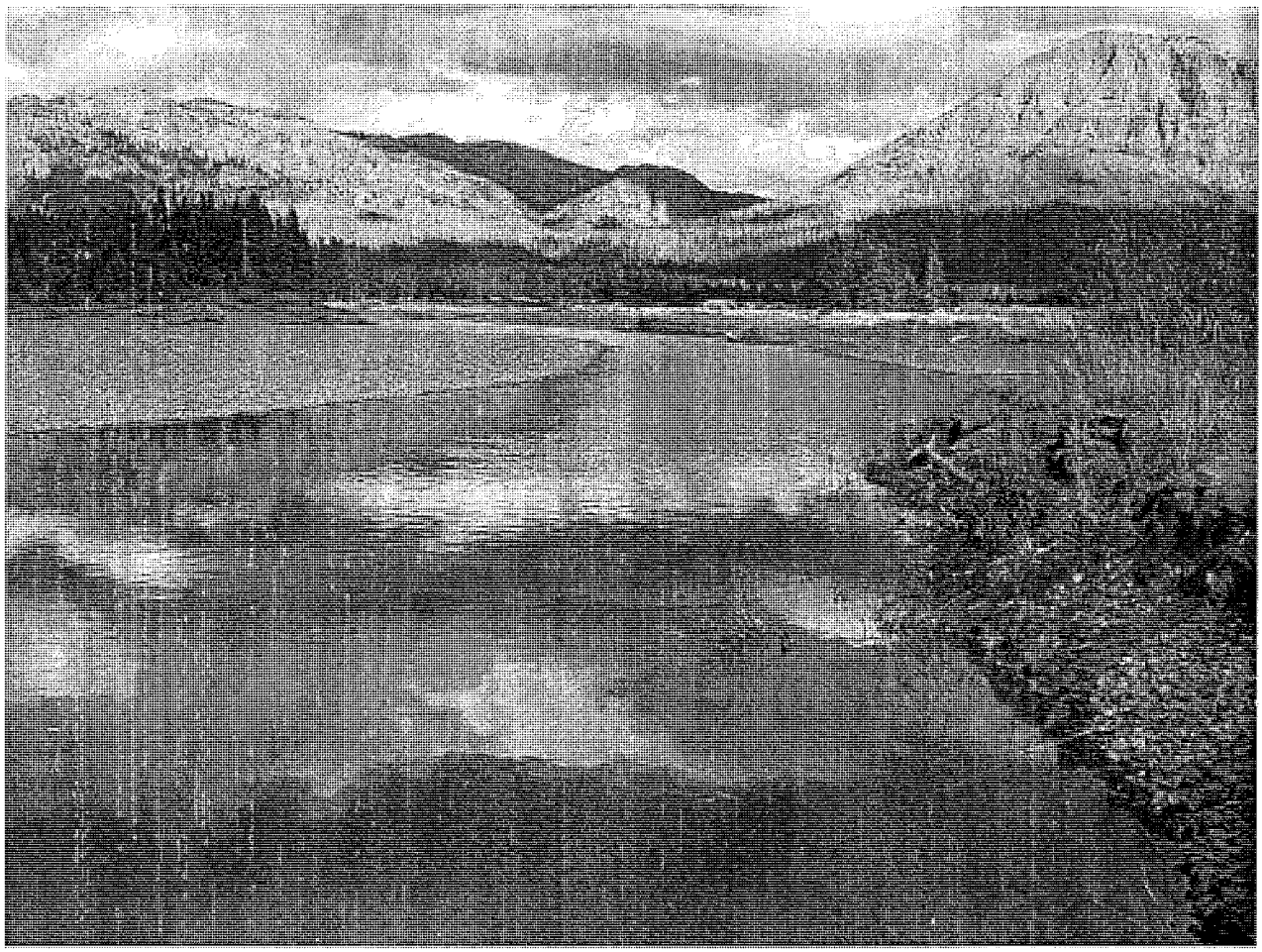
Response: *An MRA (see example MRA; Pages 339-340) would be completed, and implemented in wilderness areas that could potentially be affected by the project. This sentence has been added to page 211, section 2a and noted in the Errata Sheets. All MRA's would have to meet approval by the proper authorities within Yellowstone National Park prior to project implementation.*

Yellowstone National Park
ID, MT, WY

National Park Service
U.S. Department of the Interior

Wetland Statement of Findings

Native Fish Conservation Plan



Prepared by:
Fisheries & Aquatic Sciences Program
Center for Resources, PO Box 168
Yellowstone National Park, WY 82190
(307) 344-2281; todd_koel@nps.gov

May 2011

Wetland Statement of Findings
Native Fish Conservation Plan

Environmental Assessment

May 2011
National Park Service
Yellowstone National Park

Recommended:

Superintendent,
Yellowstone National Park

5/9/2011
Date

Concurred:

Joel Wagner, Acting Chief

5/10/11
Date

WASO - Water Resources Division

Approved:

Regional Director
Intermountian Region

5/18/11
Date

G.1 Introduction

Yellowstone National Park (YELL) has prepared and made available an Environmental Assessment (EA) analyzing a park wide Native Fish Conservation Plan under an adaptive management framework for conserving native fish from threats of non-native species, disease, and climate-induced environmental change.

Executive Order (EO) 11990 requires the National Park Service (NPS) and other agencies to evaluate the likely impacts of actions in wetlands and waters of the U.S. and their associated values. National Park Service Director's Order #77-1: Procedural Manual 77-1: Wetland Protection provides NPS policies and procedures for complying with EO 11990. This Statement of Findings (SOF) has been prepared in accordance with these NPS wetland protection procedures.

This SOF is a programmatic document that will address potential native fish restoration activities involving the application of piscicides, construction of a barrier on Specimen Creek, alteration of waterfalls on Grayling and Soda Butte Creeks, modification of sandbars on tributaries to Yellowstone Lake (YSL), and reconstruction of the Clear Creek Weir. All of these actions are discussed programmatically only. This SOF was prepared to focus on activities that have the potential to have adverse impact on wetlands and waters of the U.S. and their associated values. Further SOFs may be required after additional assessments are completed and it is determined that actions of specific projects do not qualify as excepted actions under DO-77-1.

This SOF has been prepared as a companion document to the Native Fish Conservation Plan / Environmental Assessment (EA) for Yellowstone National Park. The EA incorporates a comprehensive adaptive management strategy for conserving native fish across YNP for the coming decades. The projects discussed here are not a comprehensive list of all potential future projects with a nexus to DO-77-1. In the event that projects utilizing additional application of piscicide, construction or modification of fish barriers, or other activities that disturb wetlands, or cause other non-exempt wetland impacts (as defined in National Park Service 2008, National Park Service Procedural Manual #77-1: Wetland Protection) are proposed we would prepare additional WSOF's. Additional WSOF's would be released for public review and would be considered additional companion documents to the current (2010) Native Fish Conservation Plan for Yellowstone National Park / Environmental Assessment.

G.2 Proposed Action

This SOF is programmatic in nature. It introduces the potential actions of the Native Fish Conservation Plan and provides details on these actions to the extent possible at the time of public review. The level of detail provided varies by category of action, including:

- Information on projects related to the use of piscicides and to the removal of sandbars blocking Yellowstone Lake tributaries provide necessary site-specific detail to make an accurate determination on the amount of adverse impact;
- Information on reconstruction of the Clear Creek weir, fish barrier construction on Specimen Creek, and modification of existing waterfalls (on Grayling Creek and Soda Butte Creek) are preliminary. Additional hydrologic assessments are planned prior to initiation of these projects.

Although the Native Fish Conservation Plan addresses projects parkwide, only those representative projects proposed for piscicide treatment in this WSOF are covered under this WSOF. The same applies to construction, reconstruction, or modification of structures. For each specific project, an additional site-specific SOF will be developed if an assessment determines that it does not qualify as an excepted action under DO-77-1. Some projects may be excepted if they are designed for the purpose of restoring degraded (or completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes (NPS Procedure Manual #77-1; 4.2.1); temporary wetland disturbances directly associated with such restoration as well as actions causing a cumulative total of up to 0.25 acres of new long-term adverse impacts on natural wetlands may be considered excepted actions. Proposed projects must also satisfy the BMP's/Conditions found in Appendix 2 of NPS Procedural Manual #77-1 to qualify as excepted actions. Because a primary goal of the Native Fish Conservation Plan is to restore and maintain the important ecological role of native fishes and if hydrologic assessments can show these other parameters to be met, it is anticipated that at least some of the proposed actions will be exempt. Others that do not meet these parameters or do not meet the "Conditions" for excepted actions will require separate project-specific SOFs.

Four alternatives are evaluated in this Environmental Assessment, They are briefly summarized below. Please note that only activities involving piscicide application, construction or alteration of barriers, modification of sandbars on tributaries to YSL and reconstruction of the Clear Creek weir are addressed in this WSOF. Other activities pertinent to DO-77-1 would be addressed in separate WSOF's.

G.2.1. Alternative 1: No Action – Continuation of Current Management Practices

The no-action alternative would result in a continuation of efforts at existing levels to conserve native fish.

G.2.2. Alternative 2: (Preferred Alternative) Full Use of Native Fish Conservation Techniques and Lake Trout Carcasses Returned to Yellowstone Lake

The second alternative would conserve Yellowstone Lake YCT by an increase in removal of lake trout by private sector, contract netters; and would conserve Arctic Grayling (GRY), westslope cutthroat trout (WCT), and Yellowstone cutthroat trout (YCT) elsewhere by the construction of fish barriers to exclude non-native fish, removal of nonnative fish using EPA approved piscicides (fish pesticides) followed by restocking of native species from genetically-unaltered brood sources in the Greater Yellowstone Ecosystem (GYE). Native non-game species (i.e. sculpin) would also be restocked from downstream sources after treatments are completed. Non-native species targeted for removal include brook trout (BKT), brown trout (BNT), rainbow trout (RBT), and cutthroat –rainbow trout hybrids (CTX). Under the preferred action the following are examples of potential projects under consideration:

G.2.2.1. De Lacy Creek

Brook trout are proposed to be removed from De Lacy Creek with the use of piscicides, followed by a YCT restocking effort.

G.2.2.2. Elk Creek Complex
This project would remove BKT using piscicides with subsequent restocking of YCT.

G.2.2.3. Gibbon River (upper)
Non-natives such as BKT, BNT, and RBT are proposed to be removed in this section of river upstream of Gibbon Falls by piscicides followed by the restocking of AGY &WCT.

G.2.2.4. Goose Lake Chain
This project would remove RBT that were previously stocked in this historically fishless lake. The proposed project would utilize piscicide to remove the RBT from the Goose Lake chain, including all streams between the lakes, and replace them with a self-sustaining population of WCT.

G.2.2.5. Pocket Lake
Pocket Lake is proposed for removal of BKT by use of piscicide followed by a restocking of YCT. Not only would the entire area of the lake be treated, but the upstream tributary and downstream to the lower waterfall would be treated as well.

G.2.2.6. Clear Creek
For more than 50 years information concerning spawning YCT from YSL was collected at a weir on Clear Creek. The weir was located approximately 250 meters upstream of the confluence with YSL (Figure G-1). In 2008, high water damaged the existing weir, rendering it inoperable. The NPS is proposing to reconstruct the weir in a fashion that would allow the weir to again monitor spawning YCT and would minimize impacts to hydrology and wetlands or waters of the U.S. and their associated values.

Construction Required

The proposal would include utilization of some elements of the structure that remained undamaged in 2008 and removal, redesign, and reconstruction of other elements. Also included in the proposal is restoration of stream bank erosion caused by the old structure. At present, students from Montana State University's Engineer Department, with guidance from NPS staff, are developing conceptual designs (Figure G-2). Construction would utilize non-native materials like concrete and rebar to create permanent bulkheads along the stream bank with a removable weir that transects the stream channel. The weir would only be operated on a temporary basis during YCT spawning. The remainder of the year water would pass uninhibited, thus reducing impacts to hydrology. While repair or even reconstruction on instream diversions can be considered excepted actions, impacts to wetlands or waters of the U.S. and their associated values may not exceed the minor deviations allowed (totaling up to 0.1 acres). Current designs anticipate total activities would occur in an area approximately 60 feet wide by 150 feet wide, or 9,000 square feet (or 0.2 acres).

G.2.2.7. Grayling Creek
This project would remove non-natives such as BNT, RBT, and CTX by use of piscicide followed by a restocking of AGY and WCT. A small existing bedrock waterfall would be modified to ensure it is a complete barrier to passage by nonnative fish (rainbow and brown trout) as they attempt to move upstream. The waterfall is located out of public view in a steep canyon near Montana HWY 191, 15 miles north of West Yellowstone, MT. The waterfall is approximately 2 meters in height (Figure G-3). A deep (1 m depth) pool ("plunge pool") exists

immediately downstream at the base of the falls. The falls is bounded by bedrock and boulders on both sides.

Cracks in the bedrock and large boulders on both sides of the falls have resulted in short cascades that are passable by nonnative trout moving upstream under some flow conditions. Additionally, the presence of the plunge pool at the base of the falls currently allows for larger nonnative trout to aggressively swim up through the pool and leap over the center of the falls, by-passing the feature and allowing for their continued movement into upper reaches of the watershed.

Modification Required

Design criteria for an effective fish barrier are that they are capable of physically withstanding a 100-year flood event, and that they must prevent the upstream passage of nonnative trout at all flows up to and including a 100-year flood event. For nonnative brown, brook, and rainbow trout, this typically would be a natural waterfall or man-made barrier that is at least 6 ft in height. This is only general guidance, however, as conditions at each site vary. The presence of a splashpad (or other velocity barrier) downstream of the barrier would greatly influence fish jumping ability and dictate what barrier height would be required to preclude passage by trout. For additional guidance on fish barrier design criteria, see an Evaluation of the Efficiency and Efficacy of Non-Native Fish Eradication and Exclusion Techniques for Native Fish Restoration at http://wildfish.montana.edu/projects/ee_summary.asp.

On Grayling Creek, to direct all water flow over the center of the falls, short walls ("wing walls") would be constructed of native rock and mortar/concrete (that is dyed a natural bedrock color). The walls would be built extending from the bedrock on both sides of the stream, and during normal flow conditions, water would no longer flow over the short cascades along each side of the falls. Each wall would be approximately 1.3 meters height, 0.6 meter thick, and extend approximately 2.5 meters into the channel (Figure G-3).

The existing plunge pool below the Grayling Creek falls would be filled with native rock and would be covered with a pad ("splash pad") to prevent scour and reformation of the pool. The fill would be native rock, logs, or other material found on site and the splash pad would be constructed of logs, concrete and/or steel.

A steel mesh grate ("drop through grate") may be placed between the wing walls and extend outward (downstream; Figure G-3) along the upper front margin of the falls. Stream flows would pass over the center of the falls and through the drop through grate, prior to landing on the splash pad below. The steel mesh grate would fully ensure that no nonnative trout are able to bypass the feature.

G.2.2.8. Soda Butte Creek

This project would protect remaining YCT in Soda Butte Creek upstream of Ice Box Canyon. In order to preserve native Yellowstone cutthroat trout in the upper reaches of Soda Butte Creek we would modify an existing bedrock waterfall to ensure it is a complete barrier to passage by nonnative fish (rainbow and brook trout) as they attempt to move upstream. The waterfall is located out of public view in a steep canyon (Ice Box Canyon) along the East Entrance Road, east of Tower Junction.

Ice Box Canyon contains a series of small falls and cascades (each approximately 2 meters height) which are bounded by steep bedrock on both sides. There is one feature within this series of falls and cascades that represents a significant barrier to upstream movement of trout (Figure G-4). However, a large crack in the bedrock has formed a chute that may be passable by fish under some flow conditions. Of particular concern is the west bank of the falls where a large crack in the bedrock ascends the falls creating a single steep (but potentially passable) cascade.

Modification Required

Flows would be diverted away from the bedrock chute along the eastern margin of the falls using portable canvas and rocks. A concrete form would be constructed within the chute using common framing lumber. The form would be placed near the downstream end of the chute to create the largest possible water drop upon completion of the project. Concrete would be used to fill approximately 8 meters of the chute, upstream of the form, to an elevation equal to the bedrock surface. By filling the chute in this way, flows would be carried farther downstream (and over the filled chute) and drop from a much greater height.

The modification to Ice Box Falls may also require construction of a wing wall to direct all flows over its center. This wall would be approximately 1.3 meters height, 0.6 meter thick, and extend approximately 1.5 meters into the channel. The wall would be constructed of native rock and mortar/concrete (that is dyed a natural bedrock color). The wall would be built extending from the bedrock on the western side of the stream.

G.2.2.9. Specimen Creek

During 2006 – 2010 native westslope cutthroat trout were restored to the East Fork of Specimen Creek (EFSC) temporarily isolated from the remainder of the Specimen Creek watershed by a man-made barrier to upstream movement of nonnative trout (rainbow and brown trout). The EFSC fish barrier is a log structure placed in a remote canyon, 5 km from the trailhead at HWY 191 (Figure G-5). Although this work represents a significant advancement in the conservation of westslope cutthroat trout, the overall goal remains to restore the entire watershed (including the North Fork of Specimen Creek and the mainstem) extending downstream to near the HWY 191 road bridge. Upon completion of the watershed restoration, the EFSC barrier would be removed and the area rehabilitated to its natural condition.

To restore native westslope cutthroat trout to the entire Specimen Creek watershed, it would first be protected from invasion by downstream sources of nonnative trout (in the Gallatin River) via a permanent fish barrier constructed largely of concrete and steel. The barrier site is well within public view near the Specimen Trailhead parking area, 26 miles north of West Yellowstone, MT. The site consists of an abandoned road bed (old HWY 191) that intersects Specimen Creek approximately 75 meters upstream of the existing highway bridge and forms an existing low "dam" across the floodplain (Figure G-6). Specimen Creek flows through a narrow notch in the embankment, where a bridge once stood. Analysis of this site using Hec-Ras hydrological modeling (White 2008) indicates that it is a feasible site for barrier construction. Bankfull widths of the creek average 9 meters at undisturbed cross-sections (Figure G-7).

Construction Required

A confined, flat weir with concrete splash apron would be constructed (Figure G-8). The weir would concentrate streamflow within a confined cross-section and direct it over a flat crest. The apron would prevent scouring and development of a plunge pool downstream of the weir. The

lateral constriction and elevation drop at the weir, coupled with the smooth flat splash apron, would concentrate the energy of the streamflow and cause a supercritical flow zone immediately downstream of the weir base. Water velocity within this supercritical flow zone would be extremely high and depth is relatively shallow, making leaping (or even entering the zone) extremely difficult for fish.

G.2.2.10. Yellowstone Lake

Proposed actions for YSL include the modification of sandbars that have blocked the mouths of YCT spawning tributaries through natural wave action to re-establish surface flow to YSL. This reconnection with the Lake would allow YCT to move upstream to spawn in the spring and juveniles would be able to descend the tributaries in the fall. This proposal would include the movement of sand and gravel by shovel to adjacent non-vegetated shoreline areas that would not impact other resources. If a species of special concern is found and could not be mitigated for, the tributary would be removed from further consideration for enhancement of YCT spawning areas. In particular, the Yellowstone sand verbena (*Abronia ammophila*) is a species endemic to Yellowstone which is being evaluated for listing as a federal threatened or endangered species that inhabits the sand along YSL shores, and would be highly protected in restoration activities.

G.2.3. Alternative 3: Full Use of Native Fish Conservation Techniques and Lake Trout Marketed and/or Donated

The third alternative would implement the same actions as Alternative 2, except that lake trout would be removed from Yellowstone Lake and marketed or donated by the contract netters.

G.2.4. Alternative 4: Limited Use of Native Fish Conservation Techniques

The fourth alternative would attempt to conserve native fish using a limited toolbox of methods; contract netters and piscicides would not be used. Modification of sandbars at YSL tributary mouths would occur under Alternative 4.

Of the four alternatives, only alternatives 2 and 3 would fully meet plan objectives to preserve, protect, and restore the full range of native fish species and natural ecosystem processes of YELL over the long term. Aquatic resources would be adaptively managed using a hierarchical series of desired outcomes (primary – tertiary), each chosen based on conservation value, technical feasibility, environmental impact analysis, and resource availability. Long-term monitoring of performance metrics would be used to track responses to conservation actions, guide the adjustment of these actions, and determine success or failure (quaternary outcome) of individual projects.

None of the alternatives would have more than moderate impacts to the environmental setting, including geologic, water quality and quantity, wetlands, and vegetation; to fish and wildlife resources, including special status species; or to social and economic resources, including health and human safety, visitor use and experience, park operations, and wilderness. Alternative 2, the preferred alternative, would result in both short-term adverse and long-term beneficial impacts to these resources. None of the alternatives would result in impairment of park resources.

G.3 Site Descriptions

G.3.1. Affected Wetlands or Waters of the U.S. and Their Associated Values in Potential Project Areas

The Native Fish Conservation Plan/EA was designed to address a range of potential projects in streams, rivers, and lakes across the historic ranges of native fish in YELL. However, this is not intended to be a complete list of all projects to be completed under the plan. Additional projects may be developed based on emerging information and changing environmental conditions. This WSOF covers piscicide treatments only in those stream segments identified in this WSOF. This WSOF covers only those structures identified in this WSOF (though even so, additional WSOFs may be needed for these structures if they do not fully qualify as excepted actions). Any other piscicide treatments or construction, reconstruction, or modification of structures not covered in this WSOF would need to be addressed in a new WSOF(s) (unless they fully qualify as excepted actions). Similarly, projects included in the list below may be removed from consideration or considered for less-desirable conditions if they are found to be technically unfeasible, resources for completion are not available, or impacts are determined to be unacceptable.

There are 24 wetland types that would potentially be impacted (Table G-2). The types of wetlands present have been interpreted from the NWI classification system (Table G-3). The majority of potentially impacted wetlands from restoration activities in Yellowstone were identified as "PEMC" interpreted as palustrine habitat that is seasonally flooded and characterized by emergent plant growth. For several reasons only a very small percentage (<5%) of the wetlands identified in Table G-3 would actually be affected by piscicide application. Only wetlands that featured a surface water connection to the project stream or were found to bear fish at the time of the treatment would be impacted. Since many wetlands are seasonal, not connected to the stream channel by surface flow, and/or are not inhabitable by fish, a large percentage of wetlands would not require piscicide treatment. In order to minimize the impacts to wetland areas, treatments would be scheduled for the late summer period when seasonal wetlands are dewatered and seasonal overland connections between stream channels and wetlands are minimal.

G.4 Potential Impacts to Wetlands, Other Waters of the US and Associated Values

Potential impacts to wetland areas during or after restoration activities would be small relative to the treatment area and would only impact wetlands for the short-term. It is important to note that many of the values associated with these wetlands would be impacted, even if these impacts would be negligible in the long-term. These wetland values include the biology, both floral and faunal, as well as hydrology and nutrient cycling.

G.4.1. Potentially Impacted Wetland Areas

The primary areas to be impacted are the lakes and streams (as opposed to the adjacent vegetated wetlands). The lower reaches of the target streams are classified in the National Wetland Inventory classification system as upper perennial riverine, unconsolidated bottom or

unconsolidated shore, portions of the higher reaches of the target streams are variously classified as intermittent streambeds that are seasonally or temporarily flooded. The majority of potentially impacted habitats within the Goose and Pocket lake treatment areas are classified as lacustrine deepwater habitats. Approximately two-thirds of both projects would occur in this habitat type, which are not designated wetlands under the Cowardin System. All of the streams to be treated with piscicides are free-flowing and unimpacted with the exception that non-native fish are displacing native fish populations, and disturbing the natural species composition of other organisms such as aquatic macroinvertebrates and amphibians. The lakes are similarly unimpacted and both the streams and lakes support popular sport fisheries.

To quantify the area impacted by potential future piscicide treatments, total stream length was calculated by including all stream reaches between upper barriers to fish movement or the furthest extent of water and large bodies of water or current or potential lower barriers. To quantify the area impacted by barrier/weir construction or modification we estimated the area impacted by construction activities as well as areas impacted by pooling of water. All potential restoration projects that would impact wetlands through piscicide application, barrier construction or sandbar modification are summarized below. In order to clarify the types of activities being considered and range of waters where projects occur, specific examples are described below (Table G-1 summarizes):

G.4.1.1. De Lacy Creek

De Lacy Creek treatment would begin in headwater areas except for the case of two west branches where treatment would begin below waterfalls. The project would cover 44.7km of stream and total less than 5 acres of river area. De Lacy Creek treatment would end where the system enters Shoshone Lake, encompassing the entire delta area.

G.4.1.2. Elk Creek

The Elk Creek Complex project would include the upstream portions of Elk, Lost and Yancy Creek below natural waterfall barriers. These three forks form the main stem of Elk creek which would also be part of the treatment and would reach below the lower falls on Elk Creek, just upstream from the Yellowstone River. The total stream length potentially impacted is 11.5km and river area would be approximately 1 acre.

G.4.1.3. Gibbon River

The Gibbon River potential treatment area would be as large as 63 acres, the total stream length would be 179.4 km. The treatment area would include the whole watershed above Gibbon Falls and areas above and below all other natural falls would be treated.

G.4.1.4. Goose Lake Chain

The Goose Lake treatment would encompass Goose Lake and with two other small lakes upstream of Goose Lake (Goose Neck Lake and other unnamed) with a surface area of 42 acres. The total stream length treated would be 4.6km with an area of treatment less than half an acre.

G.4.1.5. Pocket Lake

Treatment of Pocket Lake (less than 14.5 acres) would include a small section of stream above Pocket Lake as well as the section of stream below the lake, to a naturally existing waterfall. In total 2.8km of stream would potentially be affected and in total less than half of an acre of stream area would be treated.

G.4.1.6. Clear Creek

The construction of a replacement weir on Clear Creek would not utilize piscicide and thus stream wetland area impacted is not quantifiable in this manner. Total area impacted by the construction and structure would be less than 0.25 acres.

G.4.1.7. Grayling Creek

The Grayling Creek project would impact 72.3 kilometers of stream, treating from the uppermost extent of water in the drainage to a natural waterfall located near Highway 191. This project would include a modification of the Grayling waterfall. Pooling of water behind the altered structure would be less than 0.25 acres. The total acreage of stream treated with piscicide would be less than 19 acres.

G.4.1.8. Soda Butte Creek

Although alterations to the current falls on Soda Butte would require construction the area affected during construction and as a result of pooling would be less than .25 acres. This project would not utilize piscicide and thus area impacted is not quantifiable in this manner.

G.4.1.9. Specimen Creek

The treatment of the Main Stem and North Fork Specimen Creek would complete the project that began in 2006 with High Lake and the East Fork Specimen Creek in 2008. For this treatment, a barrier would be constructed where Highway 191 crosses the creek. Initial calculations for the Main Stem Specimen Creek barrier (White 2008) suggest that approximately 8 acre-ft of water could pool behind the barrier during a 100 year flood event. Surface area of impounded water could be up to a maximum of 2 acres during normal, base flow conditions. Less than 0.5 Km of wetland (stream) would be impacted by water pooled behind the barrier; most of the impounded water would be impacting upland areas adjacent to the stream. Treating the creek with piscicide would impact 51.2 km of stream and potentially impact 11.5 acres of river area.

G.4.1.10. Yellowstone Lake

There are 54 spawning tributaries to Yellowstone Lake that would be considered for sandbar modification. However, it is not probable that in any season all of these tributaries would be disconnected from the lake and require treatment. The number of tributaries requiring treatment would vary based on water conditions in a given year with drought years requiring more treatments and flood years potentially requiring no treatments. When bars are modified an area of gravel estimated to be 8 meters long by 3 meters wide would need to be moved. Even in the event that all 54 spawning tributaries required treatment in a year the total area impacted would be 0.13 hectares (0.32 acres). There would be no piscicide treatment associated with this project.

G.4.2. Potentially Impacted Wetland Organisms

Riparian wetlands provide essential habitat for Yellowstone's rare plants, reptiles, amphibians, and numerous insects, birds, mammals, and fish. Their ecological function goes well beyond vegetation. These habitats provide shade and temperature regulation for fish, amphibians, aquatic macroinvertebrates and plankton communities. These wetlands also supply coarse woody debris from the riparian canopy which can add structure and shelter for aquatic organisms below the surface of a stream.

Common riparian forest trees are primarily Engelmann spruce, subalpine fir, and lodgepole pine. Understory shrubs include grouse whortleberry, huckleberry, snowberry, Utah honeysuckle, ninebark, thimbleberry, alder, and willows. The herbaceous understory is composed of bluejoint reedgrass, pinegrass, sedges, silvery lupine, false Solomon-seal, violets, and goldenrods. Open creek-side meadows are dominated by numerous sedge and grass species along with asters, fleabanes, biscuitroot, wild mint, yampah, pussytoes, buttercups, goldenrods, and lupines.

The ecological function provided by wetland resources is exemplified in the dynamics of the food chain prevalent in aquatic systems. The biotic tiers of life supported in aquatic environments are explained below.

Phytoplankton are tiny photosynthetic plants that float within the water column. The phytoplankton community includes diatoms, blue-green algae, green algae, and photosynthetic flagellates. Like other algae or vascular plants, phytoplankton transform sunlight and carbon dioxide into organic tissue through photosynthesis and are therefore considered "primary producers." When phytoplankton die, they become organic matter or food that is available for organisms at higher levels in a lake's food web. Because they are the first link in the aquatic food web, phytoplankton are vital components of lake ecosystems in Yellowstone.

Phytoplankton can play a major role in affecting water chemistry and the physical and biological properties of water. During daylight hours, photosynthesis transforms sunlight and carbon dioxide into organic tissue and produces dissolved oxygen. Adequate levels of dissolved oxygen are needed for all aquatic, gill-breathing animals to survive. At night, plants and animals use oxygen and give off carbon dioxide. Carbon dioxide can interact with water-producing carbonic acid and thus lower pH, which is generally highest during late evening and lowest during early morning.

Zooplankton are microscopic animals that are free-floating in the water column, including protozoans, copepods, cladocerans, and rotifers. They are the first consumer level in the food web, with most zooplankton feeding on algae and suspended detritus. *Daphinia* spp., the most commonly known genus of cladocerans, are small plant-eating zooplankton that graze primarily on phytoplankton. Most zooplankton are preyed upon by larger macroinvertebrates and larval fish. The 49 zooplankton taxa that have been identified in Yellowstone include 11 copepods, 22 cladocera, and 16 rotifer species. Zooplankton are directly affected by fish predation and indirectly affected by changes in the food web caused by the introduction of fish species.

Aquatic macroinvertebrates include a large array of organisms that can be seen with the naked eye and are found in a wide range of rivers, streams, ponds, lakes and wetlands. They are an important food source for fish, amphibians, and some bird and mammal species. Study of aquatic macroinvertebrates in Yellowstone during the last several decades has identified 818 aquatic macroinvertebrate taxa representing 21 distinct taxonomic groups, including aquatic insects, gastropods (snails), bivalves (mussels and clams), hydracarina (water mites), annelids (segmented worms and leeches), amphipods (scuds), isopods (pillbugs), decapods (crayfish), hydroid (hydra), turbellaria (flatworms), porifera (freshwater sponge), and nematodes (unsegmented worms).

Macroinvertebrates are important indicators of the impacts of potential stressors to water quality, such as road construction, sewage spills, and mining activities. Mayflies, stoneflies and caddisflies are indicators of good water quality because they are typically sensitive to

environmental change and most abundant in riffle habitats of streams where water quality is very good. Beetles, flies and midges, which are typically less sensitive to environmental change and have the highest densities where water quality has been compromised by natural or human-caused disturbances are indicators of poor water quality.

G.4.3. Potentially Impacted Wetland Functional Values

To address the impacts to the functional value of wetlands, effects are considered by the main restoration activities addressed in this WSOF: Construction, removal and recovery.

Construction relative to native fish restoration activities includes the construction of barriers or weirs, the modification of natural falls or cascades to create barriers and removal of sandbars to re-open spawning streams on Yellowstone Lake. These activities may have impacts on aquatic life, including fish, amphibians and aquatic macroinvertebrates, along with terrestrial wildlife, aquatic and terrestrial vegetation and localized impacts to hydrology.

Barrier and weir construction would take place within the stream channel and surrounding riparian areas. Although there is reason to assume that there would be localized trampling of vegetation, minimal amounts of vegetation would be disturbed or removed for construction purposes. During construction the addition of pack stock for transporting equipment increases potential for trampling vegetation and introducing non-native species into disturbed areas. Plankton, aquatic invertebrate, and amphibians would be directly affected by the rebuilding of a weir or barrier. The streambed and riparian areas would be disturbed, displacing plankton, aquatic invertebrate, and amphibian populations causing these organisms to become dislocated making them more susceptible to predation. Adverse impacts to wildlife that use riparian area such as otter, black bear, beaver, muskrat, American dipper, and other migratory bird species would include temporary displacement. Wildlife that use riparian areas would most likely be affected by weir and barrier construction, maintenance and monitoring activities, as human activities could interrupt their habitat and temporarily displace these animals.

Construction of the Specimen Creek fish barrier could initially alter patterns of sediment transport and debris flow. The barrier will act as a sediment trap until the upstream pool formed by the barrier fills in completely with stream substrate. During the in-filling period there could be an increase in erosion levels in the stream channel downstream of the structure, as sediment recruited from that area may not be replaced by sediment carried in from above. Once the area upstream of the barrier has filled completely, sediment transport continuity through the barrier reach should return to existing levels. The proposed design of the Specimen Creek barrier, which contains a shallow notch-shaped depression at its crest, would facilitate the movement of sediment and debris. As a part of routine maintenance of the structure by NPS crews, large (woody) debris blocked would be removed and allowed to progress downstream.

Modifications of natural waterfalls (Grayling Creek and Soda Butte Creek) by addition of concrete wingwalls and splashpads would not significantly alter patterns of sediment transport during periods of operation. Flow rates and the transport of nutrients/energy in these systems would not change due to the proposed projects. Completion of the modifications would negligibly alter local hydrology, causing a minor amount of water to pool as eddies upstream of the wingwall structures. Fish (WCT or YCT) would possibly congregate in these eddies, increasing their vulnerability to predation. Alternatively these eddies could create additional

habitat for certain wildlife species. Redirected water velocities may cause an change in the community structure of local plankton, aquatic invertebrate communities, and amphibians.

Clear Creek is one of the major spawning streams for YCT in the Yellowstone Lake watershed. Construction of the weir would require work within the stream and adjacent riparian areas. Weir maintenance and operation could seasonally inundate wetland, riparian, and upland vegetation upstream of the weir. Small numbers of fish and fish eggs could be disturbed or crushed from construction activities. Completion and use of the weir would affect the migration pattern of spawning YCT because weir impingement may cause some fish deaths and handling of fish by NPS crews would cause additional stress to spawning fish. The presence of the weir may concentrate fish and allow them to be more susceptible to predation by birds and mammals. Completion of the Clear Creek weir would seasonally alter local hydrology, causing water to pool behind the weir. Change in water velocities may cause an adverse change in community structure of the local plankton and aquatic invertebrate population and create more suitable habitat for amphibians.

Construction of fish barriers similar to the one on Specimen Creek would affect native fish resources in the immediate vicinity upstream of the barrier because construction activities may temporarily displace some fish. Barriers would permanently affect the migration pattern of local fish; however, barriers would not be placed where native fish with migratory life history strategies currently exist. Native fish populations are expected to benefit through reduced predation, competition, and hybridization with non-native fish because barrier construction would create isolated habitats where native fish could thrive. Examples of modifying existing water features that serve as partial barriers include: redirecting stream flow using wing walls, filling plunge pools with material to eliminate jumping areas, using explosives to increase the height or angle of a feature, or some combination of the above. Completion of natural structure modification would have the same impact on native species as a constructed barrier, such as temporary displacement of native species and temporal impacts to hydrology.

Modification of sandbars would move small amounts of unvegetated sand and gravel from the mouths of YSL tributaries to adjacent shoreline areas of comparable unvegetated sand and gravel. This activity would have a minor impact on hydrology as tributary streams would be allowed to flow directly into YSL instead of percolating through a sandbar before entering the lake. The activity would not disturb vegetation, alter water quality or quantity, or affect the formation of sandbars in the long-term. Effects from treatments, moving sand and gravel, would likely last one season or less, as natural wave action and sediment transport/deposition would be unaffected. Although the adverse effects on wetland biotic communities would be negligible, there is potential that moving and placing sandbar material would displace aquatic invertebrates that live within the substrate. It is also important to note that if plant species of special concern (especially Yellowstone sand verbena (Abronia ammophila) an endemic to Yellowstone which is being evaluated for listing as a federal threatened or endangered species) are found and could not be mitigated for, the tributary would be removed from further consideration for enhancement of YCT spawning areas.

Removal of non-native fish species would occur in two forms: mechanical and chemical. Mechanical removal would utilize techniques like electro-fishing and gill-netting while chemical removal would entail the use of piscicides like rotenone or antimycin and neutralizing agents such as potassium permanganate ($KMnO_4$). Applied chemicals would affect waters being treated and may affect downstream portions of the treatment area; mechanical removal would only

affect waters in the immediate work area. Chemical and mechanical methods to remove non-native fish would affect native fish resources within the project watershed, particularly in areas where native fish populations coexist with non-native fish. Both methods would have adverse affects on native fish populations found within restoration areas because some native fish could be killed or injured. The intent of these projects is to restore YCT, WCT and GRY but in project areas where native non-salmonid species (i.e. sculpin) were present before treatment they would also be restocked from downstream sources after treatments are completed. Whether removal is chemical or mechanical, short-term indirect effects may occur when localized fish populations are removed and aquatic invertebrate or larval amphibian communities are reduced because the food source for some species would be reduced. Wildlife that depends on fish and aquatic invertebrate communities may be displaced until the stream has recovered. Picivorous species such as river otter, bald eagles, and osprey would most likely be affected on larger streams; American dipper, a small, aquatic, insect-eating bird, may also be affected by chemical removal of fish and aquatic insects.

Mechanical removal would be used for selective removal projects, when the intent is to avoid complete removal of all species; however both electrofishing and gill-netting can injure or kill non-target organisms. Gill-net by catch can lead to the death of non-target fish species. Electrofishing can cause permanent injury to fish from the shock itself or from handling stress which may lead to death. Electrofishing and netting may affect plankton, aquatic invertebrates, and amphibians to a small degree by dislodging individuals, shocking individuals or from trampling. Electrofishing and netting may also affect some wildlife to a small degree by temporarily displacing them from the project area because these removal efforts would require walking in stream channels and along lake shorelines.

Piscicide treatments would have short-term impacts on the aquatic biota of wetlands. The intent of chemical treatments is a complete kill of all fish present in a habitat, thus all fish species present in treated wetland areas would be killed. As with the native species that these projects intend to restore (YCT, WCT and GRY) other native non-game species would be restored after treatment. Adult amphibians, mammals, birds, and reptiles would not be directly affected by piscicide application. Amphibians and AMI that are affected by piscicide treatment would be expected to recover completely within 3 years, and would likely recover more quickly. Chemical treatments would have adverse affects to plankton, aquatic invertebrates, and amphibians. Susceptibility and degree of impact would vary among species and life history stage. Studies have shown though, that reestablishment of native fish would in the long term improve diversity of these species and ecological function. It is very important to note that piscicide application would likely cause direct mortality to juvenile Alexander's Rhyacophilan caddisfly, a rare species.

In general, adult and juvenile zooplankton tend to be sensitive to chemical treatments, resulting in a marked decline in their population immediately after treatment, which would recover over time. Some Aquatic Macroinvertebrates (AMI) would be killed in treated wetland areas, other AMI species would be displaced, and other species would not be affected. Response by aquatic invertebrates would depend on a variety of factors including species, exposure, and method of respiration. Typically, invertebrates that are affected by chemical treatment would be dislodged and drift downstream to avoid chemical exposure. Overall affects of chemicals on individual invertebrates can range from negligible (no effect) to death. Some invertebrate taxa may be entirely removed from the population. Aquatic invertebrate populations are dynamic and highly variable, thus total recovery of some invertebrate taxa would be impossible to document. All

larval amphibians in treated wetland areas would be killed. Larval amphibians are very susceptible to rotenone which can cause 100 percent mortality; adult amphibians do not seem to exhibit adverse affect from its application. Therefore, mitigation measures (e.g., timing, relocating, and rearing individuals) would be taken to avoid these sensitive periods in life histories of aquatic organisms (see Appendix B of the EA for an in-depth discussion on impacts to non-target species).

Chemical application associated with fisheries restoration activities are not lethal to aquatic or riparian vegetation. It is the case that reduced light penetration from $KMnO_4$ applications could reduce photosynthesis in aquatic vegetation; however, impacts would be negligible since application takes place over a relatively short period of time (and 2-3 days for streams). During fish removal efforts, vegetation would be trampled or disturbed from motorized boats, walking/wading along shorelines and riparian areas, accessing application stations, angling, electrofishing, and net deployment and retrieval.

Recovery refers to active restoration of native fish populations by fisheries managers. In YELL these activities would include restocking fish from native, genetically pure brood stocks along with implementing remote site incubators (RSIs). RSIs promote natural reproduction through the placement of eggs in spawning streams for successful future recruitment, fundamental to the success of population recovery.

In restoring native populations the use of incubators would entail walking in streams and adjacent riparian areas. This could cause aquatic organisms to become trampled or dislodged making them more susceptible to predators. After restoration, all native fish species (native trout along with non-game species) would be restocked and native fish populations would benefit from returning to their historic range within the park and reducing extirpation risk within the Yellowstone ecosystem. Specifically, the recovery of YCT to the tributary streams of Yellowstone Lake would provide a long-term moderately beneficial impact on grizzly bears as YCT would again become an available food source. However, in and near developed areas, the return of YCT could increase the incidence of human/bear conflicts and could precipitate a long-term, negligible to minor adverse impact on grizzly bears in these areas.

G.4.4. Proposed Compensation

Six streams and 3 lakes are listed as representative projects where the proposed activities would cause adverse impacts to wetlands and waters of the U.S. and associated values. Specifically, the application of piscicide to water would kill some aquatic macroinvertebrates (AMI) and larval amphibians along with all native non-game species of fish. These species of fish would be restocked in treated rivers and streams from downstream sources after treatments are completed. The physical nature of the wetlands, other wetland fauna, and wetland plants would not be adversely impacted by piscicide application. Following treatments with piscicide AMI and amphibian communities would be expected to recover naturally within 3 years and likely less. Also following treatment, native fish assemblages would be restored in wetland areas, including target restoration species (YCT, WCT and GRY) and native non-game species such as the mottled sculpin. Because the nature of impacts to wetlands or waters of the U.S. and their associated values from piscicide application is temporary, and because these treatments will in the long term provide for restoration of native fish which in turn would support a more naturally functioning system, the proposed activities would be self-compensating. The same is

true for the proposed activity of movement of shoreline gravel to reconnect YCT spawning tributaries to YS.

Currently the status of native YCT, WCT and GRY across the Yellowstone region is threatened. Protecting and reestablishing these populations within the streams and lakes of YELL would benefit preservation of these threatened species throughout their natural ranges. Native species benefit their natural habitats as they have evolved as an integral part of the ecosystem. Native species have important ecological roles within their native systems and when the species assemblage of an ecosystem is altered the basic functioning of that ecosystem is often deteriorated. As an example the LKT in Yellowstone Lake (YSL) have significantly reduced the population of YCT which has resulted in impacts to multiple trophic levels within the ecosystem. Declines in several important consumer species near the lake and/or its tributaries have been documented, including grizzly bears, bald eagles, ospreys, and river otters (McEneaney 2002; Koel et al. 2005; Haroldson et al. 2005; Crait and Ben-David 2006; McEneaney 2007). The expanded LKT population and YCT loss have resulted in significant shifts in energy (nutrient) flow both within the lake and between the lake and its spawning tributaries (Tronstad 2008).

Although LKT are only issues in YELL's larger lakes (Yellowstone, Lewis and Shoshone) there are many studies that show the negative impacts of non-native trout to smaller, stream ecosystems. Non-native trout have negative impacts on wetland values, including native fish species (Peterson et al. 2004, Baker et al. 2008, Shepard 2010), amphibians (Vredenburg 2004, Knapp 2005, Knapp et al. 2007), reptiles (Matthews et al. 2002, Knapp 2005), other lake fauna and nutrient cycling (Knapp et al. 2001, Sarnelle and Knapp 2005, Schilling et al. 2009). Therefore, although it is the case that restoration activities would have short-term adverse impacts to wetlands and their flora and fauna, these activities would directly lead to long-term benefits of wetland character by restoring native species.

This may also be true for construction of fish barriers but other compensations may be necessary depending on hydrologic assessments. These compensations would be developed during the project-specific SOF process. For example, upon completion of the watershed restoration on Specimen Creek, the existing EFSC barrier would be removed and the area rehabilitated to its natural condition. This would result in 0.125 acre of aquatic habitat (stream/wetland) restored to a natural condition. Reconstruction of the Clear Creek weir would result in impacts to 0.2 acre of wetland. However, the pre-existing structure was built and operated in a way that pooled water extensively and greatly altered sediment transport. As a result, large sediment deposits (sand and gravel bars) were created both upstream and downstream of the previous structure, diverting streamflows and causing extensive streambank erosion and undercut banks. The new weir is intended to be operated in a manner that will allow open (natural) flows, to prevent further sediment deposition and bank erosion. Compensation for impacts to 0.2 acre wetland by reconstruction of the Clear Creek weir would be rehabilitation of the existing severely degraded wetland habitat upstream and downstream of the site. Approximately 0.4 acre aquatic habitat (stream/wetland) would be rehabilitated to a natural condition. As such, all activities proposed in this WSOF have the potential to be self-compensating, either through the restoration of native aquatic communities, restoration of natural aquatic habitats, or both.

G.5 Justification for Use of Wetland Areas

The purpose of this project is to restore native fish to streams, rivers, and lakes park wide in order to conserve those species and their associated communities from threats of non-native species, disease, and climate-induced environmental change. Restoring aquatic communities by removal of non-natives and restocking with native species restores aquatic habitats and ecological processes to a more natural state and function.

G.6 Investigation of Alternative Sites

Sites selected for piscicide application in the current EA and WSOF were selected from many sites by assessing their technical feasibility, conservation value, and likelihood for success. Additionally, because of the nature of the actions, comparable impacts would occur at any site where native fish restoration occurred. Alternative sites have been investigated, considered, and dismissed.

G.7 Mitigative Measures

The following are mitigations or compensatory actions that would be implemented with each project in order to reduce impacts and to maintain consistency with the NPS "no net loss of wetlands' goal found in DO #77-1.

- Each project that requires piscicide use would be managed by a certified piscicide applicator.
- Methods to mitigate piscicide use include: lowering piscicide concentration while still achieving complete eradication and adjusting treatment timing to avoid harming juvenile amphibians and AMI.
- Survey work would be completed prior to piscicide application to establish the distribution of target and non-target fish and presence of fishless water so that waters can be left untreated if treatment is not required.
- Mitigating the impacts to non-target organisms would also be accomplished by collecting and disposing of as many fish carcasses as possible immediately following treatment to avoid attraction of bears and other animals to the project area.
- Impacts to wetland areas from piscicide application would be minimized by timing treatments to coincide with the low-water period of late-summer and early-autumn to the greatest extent possible.
- In streams proposed for a project, any man-made fish barriers (culverts and other water diversion structures) would be re-engineered and replaced with structures that would allow more natural fish movement.
- For each fish barrier constructed, interdisciplinary collaboration would take place to minimize the change to the stream's natural hydrologic conditions.
- The proposed design of the Specimen Creek barrier, which contains a shallow notch-shaped depression at its crest, would facilitate the movement of sediment and debris. As a part of routine maintenance of the structure by NPS crews, large (woody) debris blocked would be removed and allowed to progress downstream.
- For each fish barrier constructed, regular monitoring of structural integrity and regular maintenance would be conducted to help assure that the restoration gains would be essentially permanent.

- Spawning stream work would not take place during the YCT spawning run when these areas are closed during the Bear Management Area restriction (until July 15th for most tributaries and August 11th for Clear Creek and the east shore of Yellowstone Lake) without consultation and approval from the Yellowstone Bear Management Office.
- Consultation from park experts concerning rare plant species, cultural resources, and wetlands before implementation of projects where sand and gravel would be disturbed.
- All disturbed areas would be restored as nearly as possible to pre-treatment conditions shortly after activities are completed.

G.8 Compliance

Current plans and policy that pertain to this proposal include the Yellowstone's Resource Management Plan (NPS 1998), the 2006 National Park Service Management Policies (NPS 2006), and other legislation. Outlined below is more information pertaining to how this proposal meets the goals and objectives of these plans and policies:

- This plan is consistent with the goals and objectives of the 2006 Management Policies (4.4.4 Management of Exotic Species) which requires national parks to prevent the displacement of native species by exotic [non-native] species (NPS 2006).
- Restoration practices including the removal of exotic species are consistent with the 2006 NPS Management Policies (NPS 2006). Section 1.4.7.2 of NPS Management Policies (Improving Resource Conditions within Parks) states,
- This plan is consistent with Executive Order 13112 which states, a federal agency is not authorized to fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions." The Executive Order requires federal agencies to develop management plans to identify invasive species and develop a plan that would prevent the introduction and reduce the risk of spread of identified species.
- This plan is consistent with Yellowstone's Resource Management Plan (NPS 1998) which identified conservation of stream communities and native cutthroat trout and controlling non-native aquatic species as a high-priority need.
- Restoration activities would be guided by the natural and cultural resource-specific policies identified in chapters 4 and 5 of these Management Policies" (National Park Service, 2006).
- Section 4.4.4.2 (Management of Exotic Species) includes the following direction:
- High priority would be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controlled. Lower priority would be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled. Where an exotic species cannot be successfully eliminated, managers would seek to contain the exotic species to prevent further spread or resource damage.

G.9 Summary

The preferred alternative was designed to avoid and minimize impacts to wetlands park wide to the greatest extent possible.

Actions proposed under the Native Fish Conservation Plan would result in substantial short-term adverse impacts to wetland ecological function through the use of piscicides and resulting loss of some macroinvertebrates. Removal of sand bars blocking some Yellowstone Lake spawning tributaries would result in short-term adverse impacts to wetland vegetation if it exists. However, long term adverse impacts would be negligible as macroinvertebrate species recover within 1-3 years following treatment and vegetation would be restored.

Reconstruction of the Clear Creek weir would result in impacts to 0.2 acre of aquatic habitat (stream/wetland). However, the new weir is intended to be operated in a manner that will allow open (natural) flows, to prevent further sediment deposition and bank erosion. Compensation for impacts to 0.2 acre wetland by reconstruction of the Clear Creek weir would be rehabilitation of the existing severely degraded wetland habitat upstream and downstream of the site. Approximately 0.4 acre aquatic habitat (stream/wetland) would be rehabilitated to a natural condition.

Construction of the Specimen Creek fish barrier would result in an upstream pool that will fill with sediment. As this occurs, sediment-poor water may scour and erode the stream immediately downstream of the barrier. However, once the pool is filled, sediment movement will return to existing levels. The Specimen Creek barrier will impound water and inundate existing (stream) wetland, resulting in long-term adverse impacts to <0.5 Km. However, upon completion of the watershed restoration on Specimen Creek, the existing EFSC barrier would be removed and the area rehabilitated to its natural condition. This would result in partial compensation for the new Specimen Creek fish barrier, as 0.125 acre of aquatic habitat (stream/wetland) would be restored to a natural condition.

Modifications to existing waterfalls on Grayling Creek and Soda Butte Creek would not significantly pool water or otherwise adversely impact wetlands, and would allow recovery of watersheds to support native species and natural, ecological processes.

Restoration of native fish and the aquatic/terrestrial species they support across up to 367 Km of stream would compensate for short term adverse impacts to wetlands and a long-term permanent loss of <0.5 Km of wetland on Specimen Creek. Overall, no significant loss of wetland area or impacts to wetland ecological function are anticipated upon implementation of the proposed actions. If project-specific compensations are determined necessary for fish barrier modification actions, these will be disclosed in separate SOFs. Therefore the NPS finds this programmatic analysis is consistent with the policies and procedures of NPS Director's Order #77-1: Procedural Manual 77-1: Wetland Protection which provides NPS policies and procedures for complying with Executive Order 11990.

Literature Cited

Baker, G., N. Darby, T. Williams, and J. Wullschleger. 2008. Bonneville cutthroat trout restoration project—Great Basin National Park. Natural Resource Report NPS/NRPC/NRR—2008/055. National Park Service, Fort Collins, Colorado.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoc. 1979 Classification of Wetlands and Deepwater Habitats of the United States. Fish and Wildlife Service, USDI, Report FWS/OBS-79-31. Washington, D.C.

Crait, J.R. and M. Ben-David. 2006. River otters in Yellowstone Lake depend on a declining cutthroat trout population. Journal of mammology 87:485-494.

Haroldson, M.A., K.A. Gunther, D.P. Reinhart, S.P. Rodruzny, C. Cegelski, L. Waits, T. Wyman, and J. Smith. 2005. Changing numbers of spawning cutthroat trout in tributary streams of Yellowstone Lake and estimates of grizzly bears visiting streams from DNA. Ursus 16:167-180.

Knapp. R.A. 2005. Effects of nonnative fish and habitat characteristics on lentic herpetofauna in Yosemite National Park, USA. Biological Conservation 121:265-279.

Knapp, R.A., D.M. Boiano and V.T. Vredenburg. 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*). Biological Conservation 135:11-20.

Knapp, R.A., K.R. Matthews and O. Sarnelle. 2001. Resistance and resilience of alpine fauna to fish introductions. Ecological Monographs 73:401-421.

Koel, T. M., P. E. Bigelow, P. D. Doepke, B. D. Ertel, and D. L. Mahony. 2005. Nonnative lake trout result in Yellowstone cutthroat trout decline and impacts to bears and anglers. Fisheries 30:11 10-19.

Matthews, K.R., R.A. Knapp and K.L. Pope. 2002. Garter snake distributions in high-elevation aquatic ecosystems: Is there a link with declining amphibian populations and nonnative trout introductions. Journal of Herpetology 36:16-22.

McEneaney, T. 2002. Piscivorous birds of Yellowstone Lake: their ecology, history, and status. Pages 121 – 134 *in* R.J. Anderson and J. Harmon, editors. Yellowstone Lake: hotbed of chaos or reservoir of resilience? 6th Biennial scientific conference on the Greater Yellowstone Ecosystem. Yellowstone Center for Resources, Yellowstone National Park, Wyoming.

McEneaney, T. 2007. Yellowstone bird report. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-2007-01.

National Park Service (NPS). United States Department of Interior. 2008. Director's Order #77-1, Procedural Manual #77-1: Wetland Protection. Fort Collins, Colorado.

Peterson, D.P., K.D. Fausch and G.C. White. 2004. Population ecology of an invasion: Effects of brook trout on native cutthroat trout. Ecological Applications 14: 754-772.

Schilling, E.G., C.S. Loftin and A.D. Huryn. 2009. Effects of introduced fish on macroinvertebrate communities in historically fishless headwater and kettle lakes. Biological Conservation 142:3030-3038.

Schindler, D.E., R.A. Knapp and P.R. Leavitt. 2001. Alteration of nutrient cycles and algal production resulting from fish introductions into mountain lakes. Ecosystems 4:308-321.

Sarnelle, O. and R.A. Knapp. 2004. Zooplankton recovery after fish removal: Limitations of the egg bank. Limnology and Oceanography 49:1382-1392.

Sarnelle, O. and R.A. Knapp. 2005. Nutrient recycling by fish versus zooplankton grazing as drivers of the trophic cascade in alpine lakes. Limnology and Oceanography 506:2032-2042.

Shepard, B.B. 2010. Evidence of niche similarity between cutthroat trout (*Oncorhynchus clarkii*) and brook trout (*Salvelinus fontinalis*): Implications for displacement of native cutthroat trout by nonnative brook trout. PhD dissertation. Montana State University, Bozeman.

Tronstad, L. M. 2008. Ecosystem consequences of declining Yellowstone cutthroat trout in Yellowstone Lake and spawning streams. Doctoral dissertation. University of Wyoming, Laramie, Wyoming.

Vredenburg, V. T. 2004. Reversing introduced species effects: experimental removal of introduced fish leads to rapid recovery of a declining frog. Proceedings of the National Academy of Sciences (USA) 101:7646–7650.

White, D. 2008. Hydrolic (Hec-Ras) analysis and conceptual design report for Specimen Creek fish barrier. Interim project report for Yellowstone National Park. Gallatin National Forest, Bozeman, MT.

Table G.1. Anticipated Stream Length (km) and Acreage Treated

	length (km)	total acreage
De Lacy Creek	45	5
Elk Creek	12	1
Gibbon River	179	64
Goose Lake	5	<1
Grayling Creek	72	19
Pocket Lake	3	<1
Specimen Creek	51	11

Table G-1. Anticipated stream length (km) and acreage treated with piscicide in potential restoration activities. The total stream length potentially treated here is 3.2% of all the known streams in YELL.

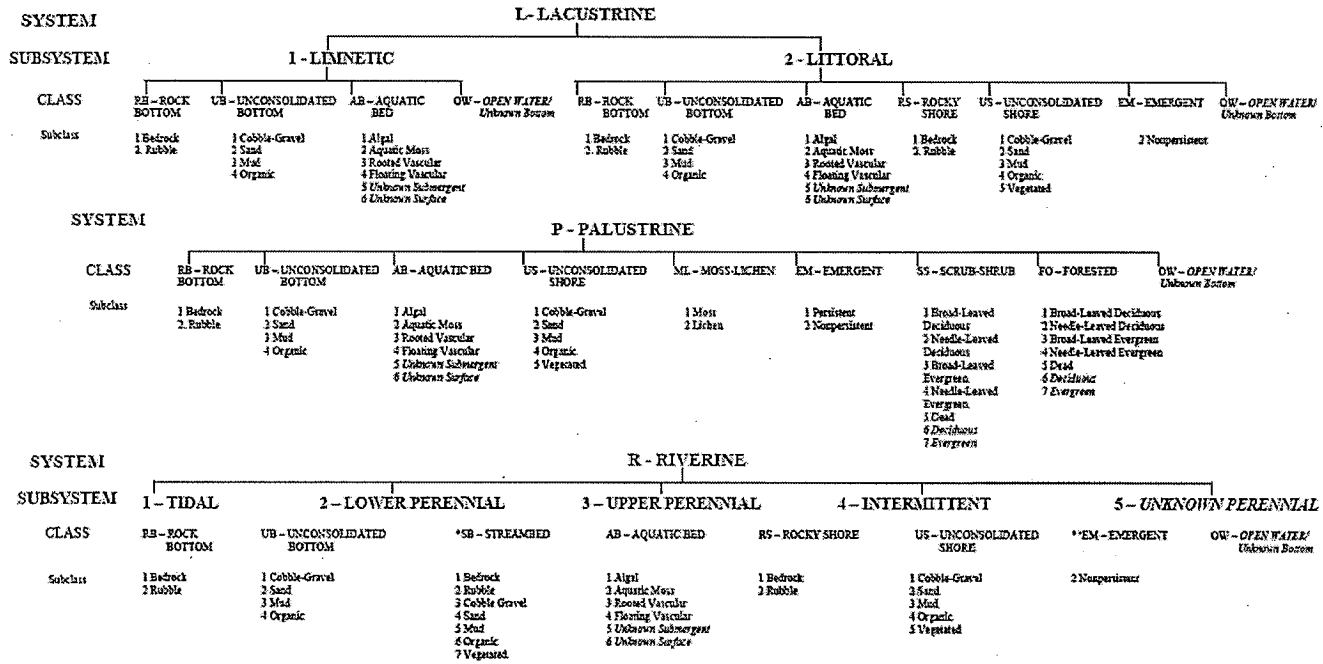
Table G.2. Wetland Types Potentially Impacted by Restoration Activities

Lacustrine	Palustrine	Riverine
L2ABG	PABF	R3UBF
L2UBG	PABG	R3UBG
L2USC	PEMA	R3UBH
	PEMB	R3USA
	PEMC	R4SBA
	PEMJ	R4SBC
	PFOA	
	PFOB	
	PFOJ	
	PSSA	
	PSSB	
	PSSC	
	PUSC	
	PUSJ	

Table G-2.Complete list of wetland types potentially impacted by restoration activities. Use Table 3 to key out the four or five letter terms (i.e. PFOB) identifying specific wetland types.

Table G.3. National Wetland Inventory classification table

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION



* STREAMBED is limited to TIDAL and INTERMITTENT SUBSYSTEMS, and comprises the only CLASS in the INTERMITTENT SUBSYSTEM.
** EMERGENT is limited to TIDAL and LOWER PERENNIAL SUBSYSTEMS.

MODIFIERS

In order to more adequately describe the wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied at the ecological system.

WATER REGIME				WATER CHEMISTRY			SOIL	SPECIAL MODIFIERS	
Non-Tidal		Tidal		Coastal Salinity	Inland Salinity	pH Modifiers for all Fresh Water			
A Temporarily Flooded	H Permanently Flooded	K *Artificially Flooded*	*5 Temporary-Tidal	1 Hyperhaline	7 Hypersaline	x Acid	g Organic	b *Beaver*	h *Diked/Impounded*
B Saturated	J Intermittently Flooded	L Subtidal	*R Seasonal-Tidal	2 Euhaline	8 Euhaline	s Circumneutral	m Mineral	d *Partially Drained/Ditched*	r Artificial Substrate
C Seasonally Flooded	K Artificially Flooded	M Irregularly Exposed	*T Semipermanent-Tidal	3 Mixohaline *(Brackish)*	9 Mesohaline	i Alkaline		f Farmed	s *Spoil*
D *Seasonally Flooded/ Well Drained*	W Intermittently Flooded/Temporary	N Regularly Flooded	*V Permanent-Tidal	4 Polyhaline	0 Fresh				w Excavated
E *Seasonally Flooded/ Saturated*	Y Saturated/Semipermanent/ Seasonal	P Irregularly Flooded	U *Unknown*	5 Mesohaline					
F Semipermanently Flooded	Z Intermittently Exposed/Permanent			6 Oligohaline					
G Intermittently Exposed	U *Unknown*			0 Fresh					

*These water regimes are only used in tidally influenced, freshwater systems.

NOTE: Italicized terms were added for mapping by the National Wetlands Inventory program.

Classification of Wetlands and Deepwater Habitats of the United States
Cowardin ET AL. 1979 as modified for National Wetland Inventory Mapping Convention

Table G-3. National Wetland Inventory classification table used to identify wetlands and deepwater habitats. Altered to incorporate those ecosystems relative to Yellowstone National Park and potential restoration activities.

Figures

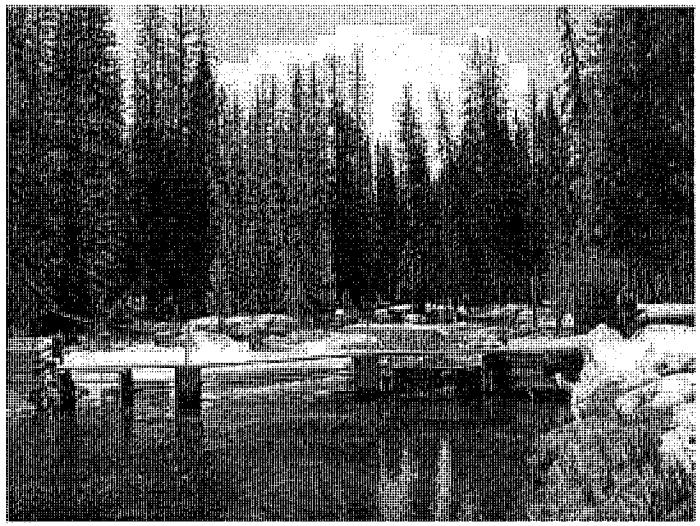


Figure 1. The original weir on Clear Creek before it was washed out by a high water event in 2008, rendering it inoperable for collecting spawning information on YCT from YSL.

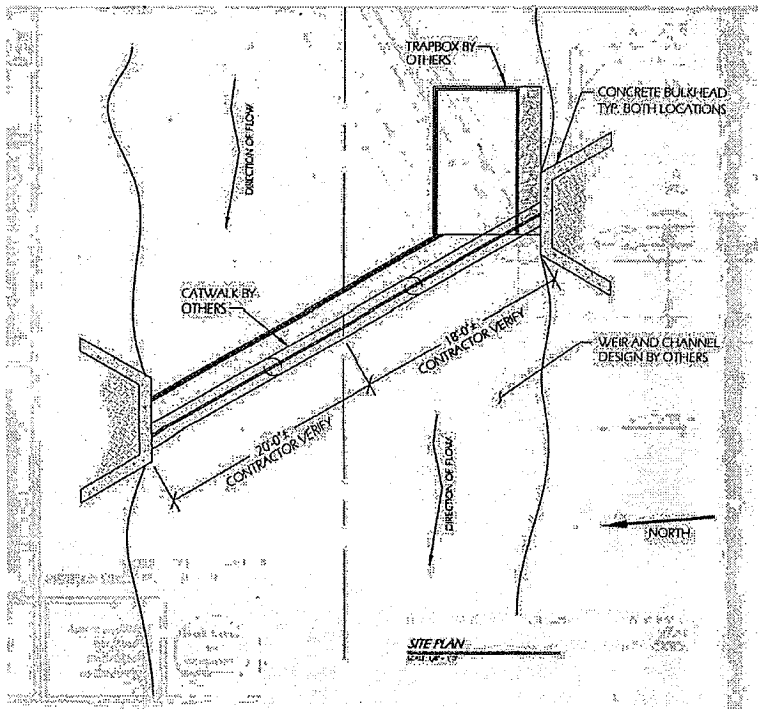


Figure G-2. Potential design for Clear Creek reconstruction.

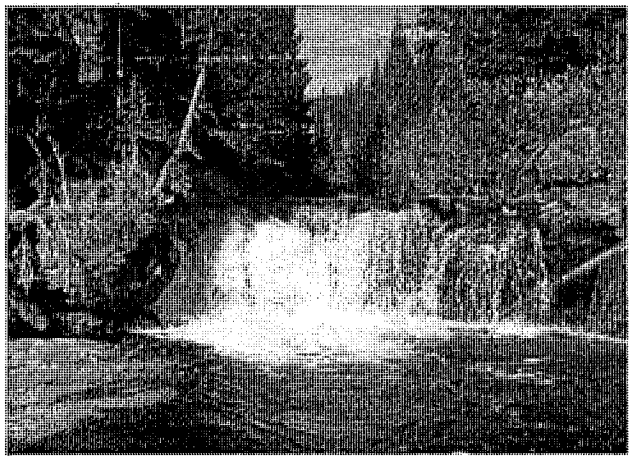


Figure G-3. Existing bedrock waterfall on Grayling Creek, a tributary to the Madison River (now Hebgen reservoir) in Yellowstone National Park.

Figure G-4. Existing bedrock waterfall on Soda Butte Creek in Ice Box Canyon, Yellowstone National Park. A large crack extends along the east side (left and out of view in photo) creating a chute that nonnative trout are able to swim up and bypass the feature.

Figure G-5. Fish barrier constructed mostly of logs and rocks in 2008 to temporarily isolate East Fork Specimen Creek for restoration of native westslope cutthroat trout. Vegetation is recovering following the Owl Fire, which burned the watershed (including the barrier site) in 2007.

Figure G-6. Location for construction of a permanent fish barrier on Specimen Creek in Yellowstone National Park. Tape extending across the stream is along the old HWY 191 road embankment. Concrete remaining from the pre-existing bridge can be seen along the right descending stream bank (left margin of the photo).

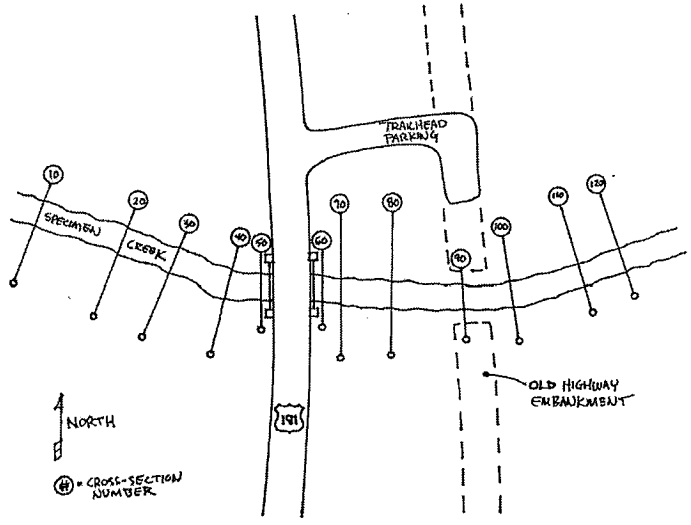
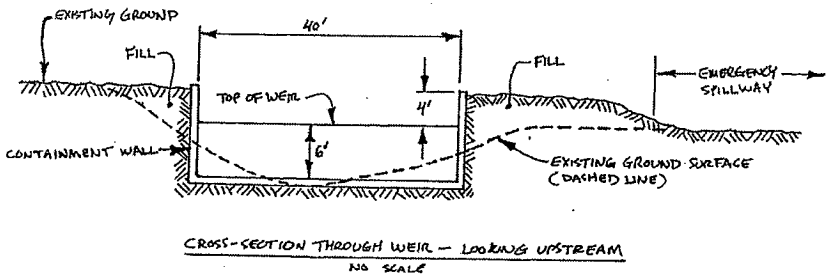


Figure G-7. Location for construction of a permanent fish barrier on Specimen Creek in Yellowstone National Park. The barrier would be placed at cross-section #90 and between the abandoned HWY 191 road embankment, just upstream of the existing HWY 191 road bridge.



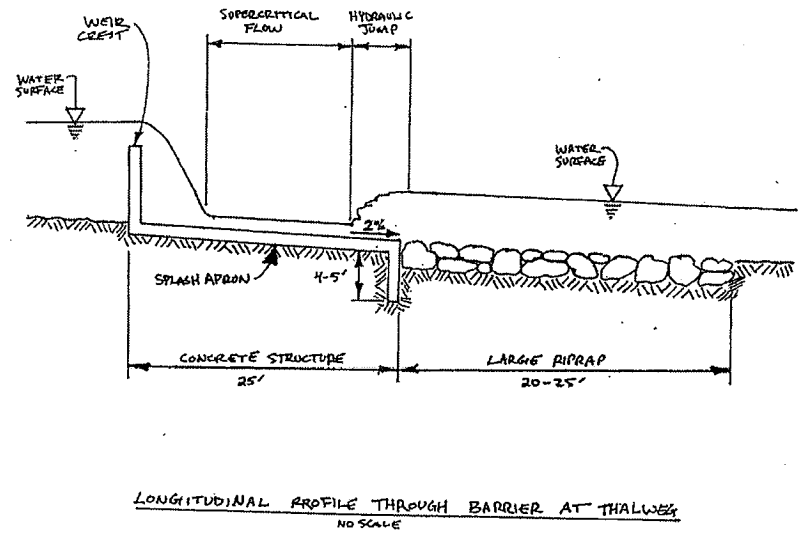


Figure G-8. Cross-section through weir (upper diagram) showing elevation of existing abandoned roadbed (existing ground) and longitudinal profile (lower diagram) showing location of splash apron extending 25 ft along stream bottom from the base of the weir.

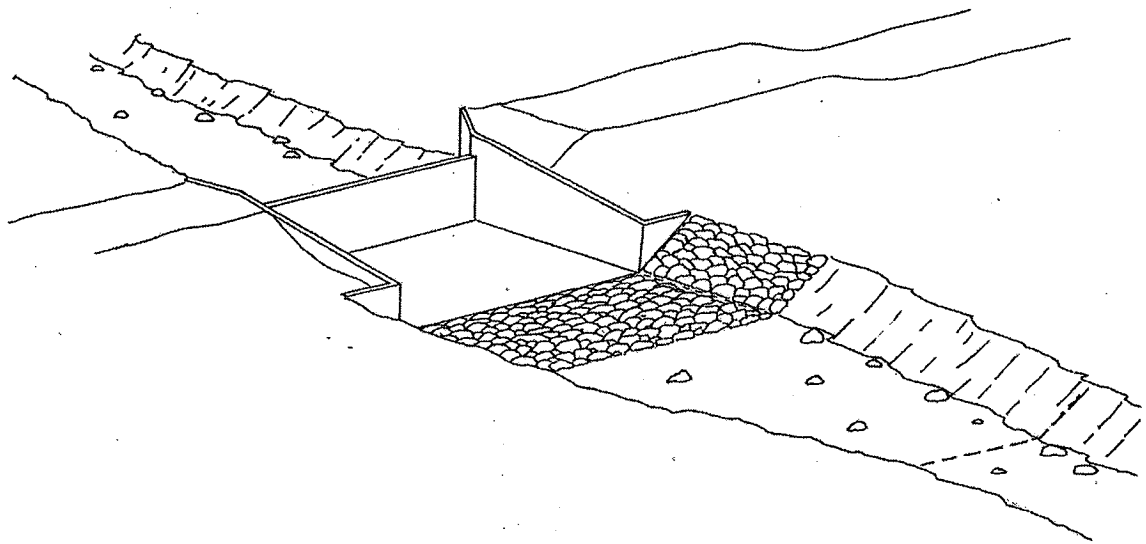


Figure G-9. Conceptual sketch of the fish barrier to be constructed on Specimen Creek, a tributary of the Gallatin River, in Yellowstone National Park. View is from below (downstream of) the barrier looking upstream to show the concrete splash pad at the base of the barrier.

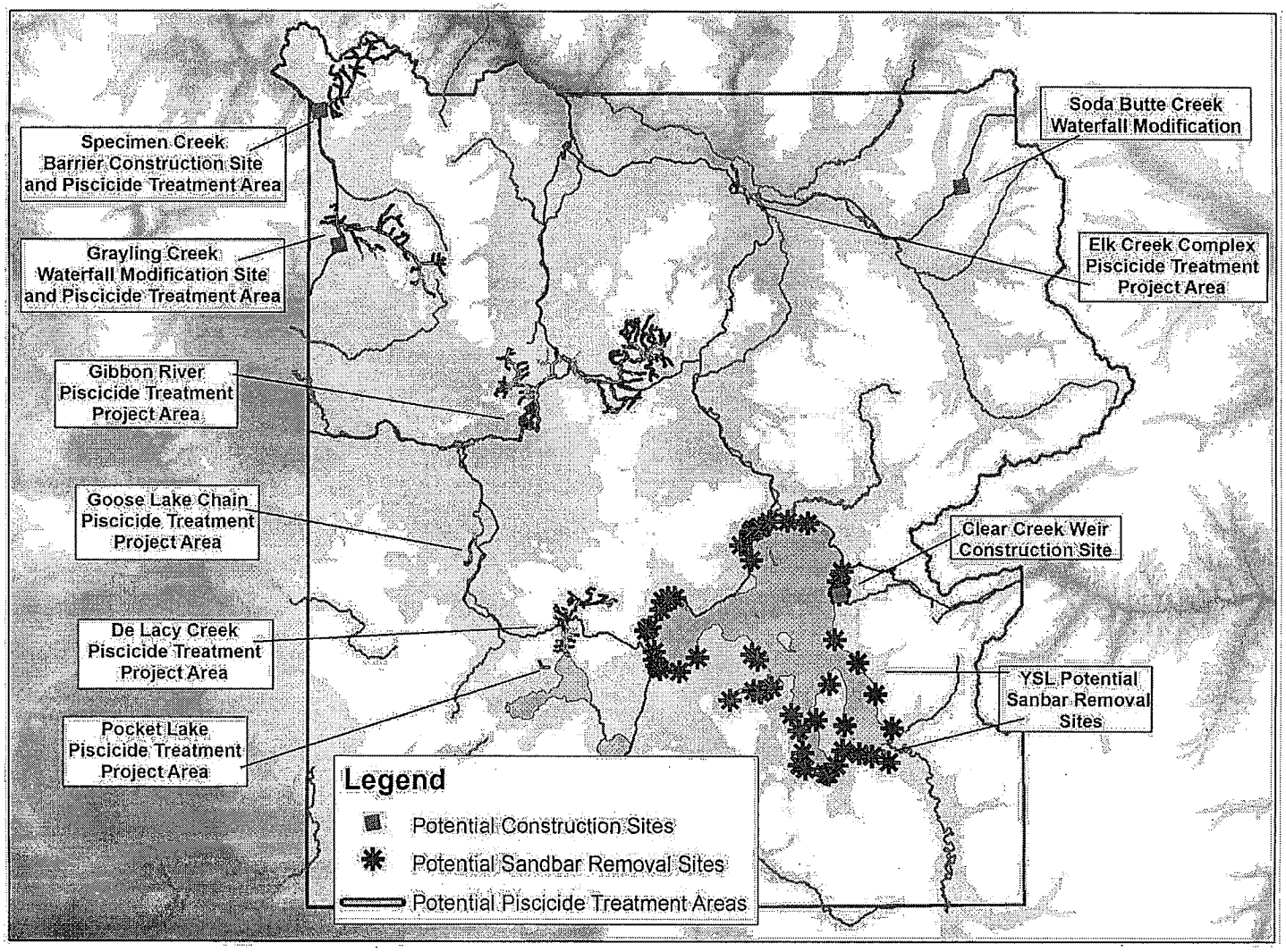


Figure G-10. All potential restoration activities included in the 2010 Yellowstone Native Fish Conservation Plan EA.

Maps of all potential restoration project areas that would include the use of piscicide or barrier construction. Maps created with National Wetland Inventory (NWI) data highlighting the wetland areas identified by 1998 NWI data (highlighted in green) along with stream wetland areas (in blue) potentially impacted by restoration activities. NWI wetlands were identified as potentially impacted due to their proximity (within 30m) to the stream, but the entire stream channel would be impacted as well.

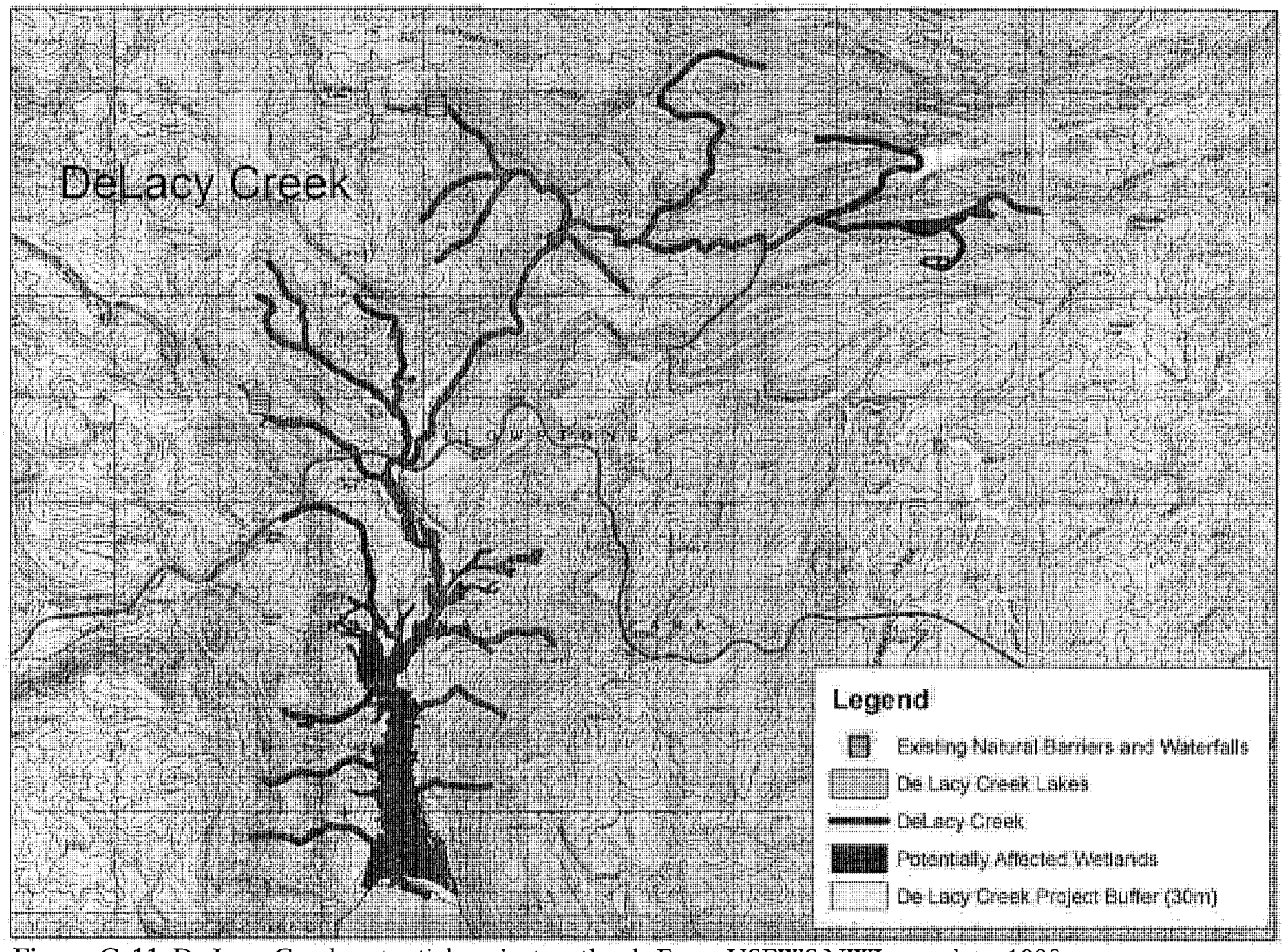


Figure G-11. De Lacy Creek potential project wetlands From USFWS NWI map data, 1998.

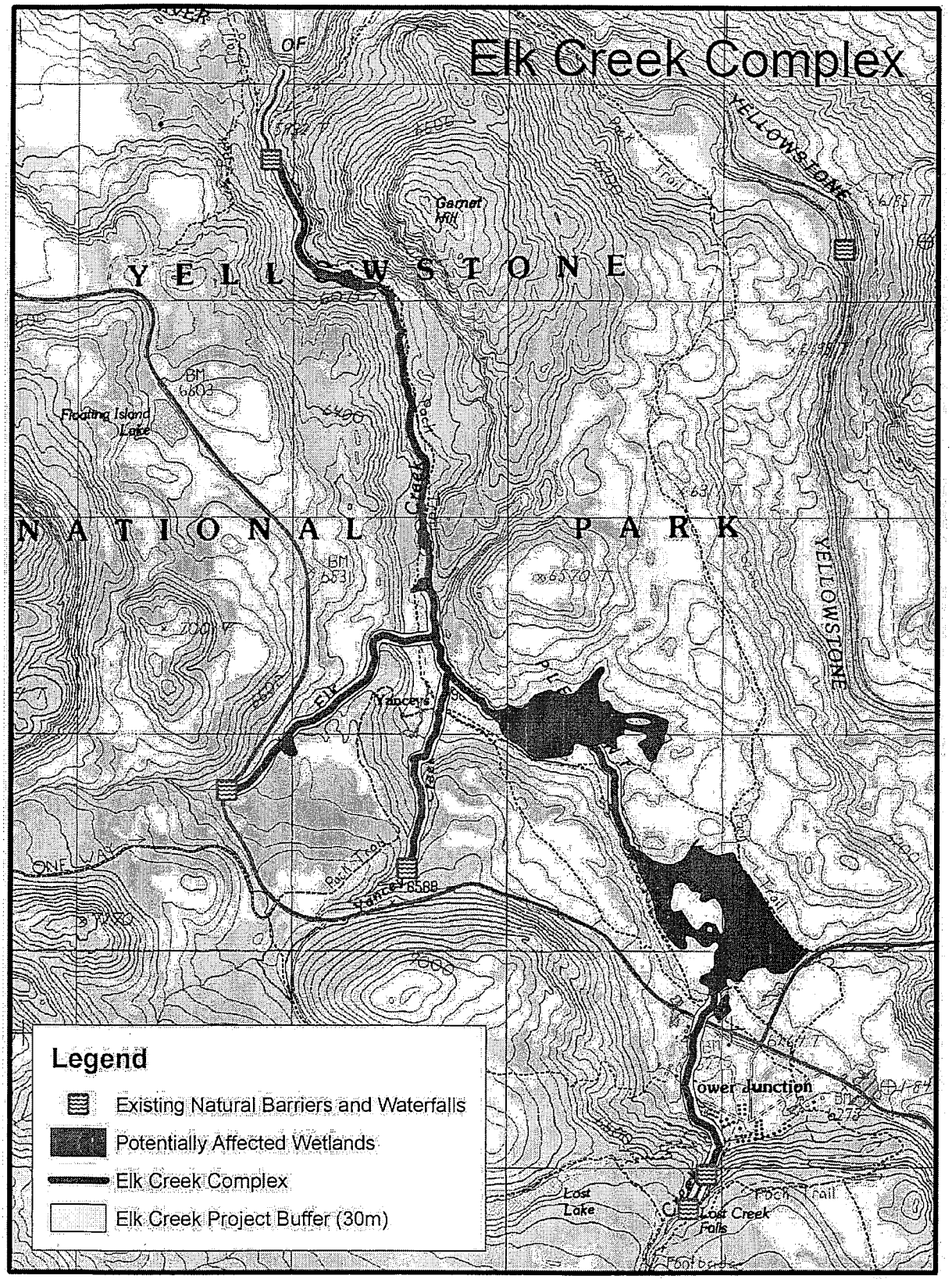


Figure G-12 Elk Creek Complex potential project wetlands. From USFWS NWI map data, 1998.

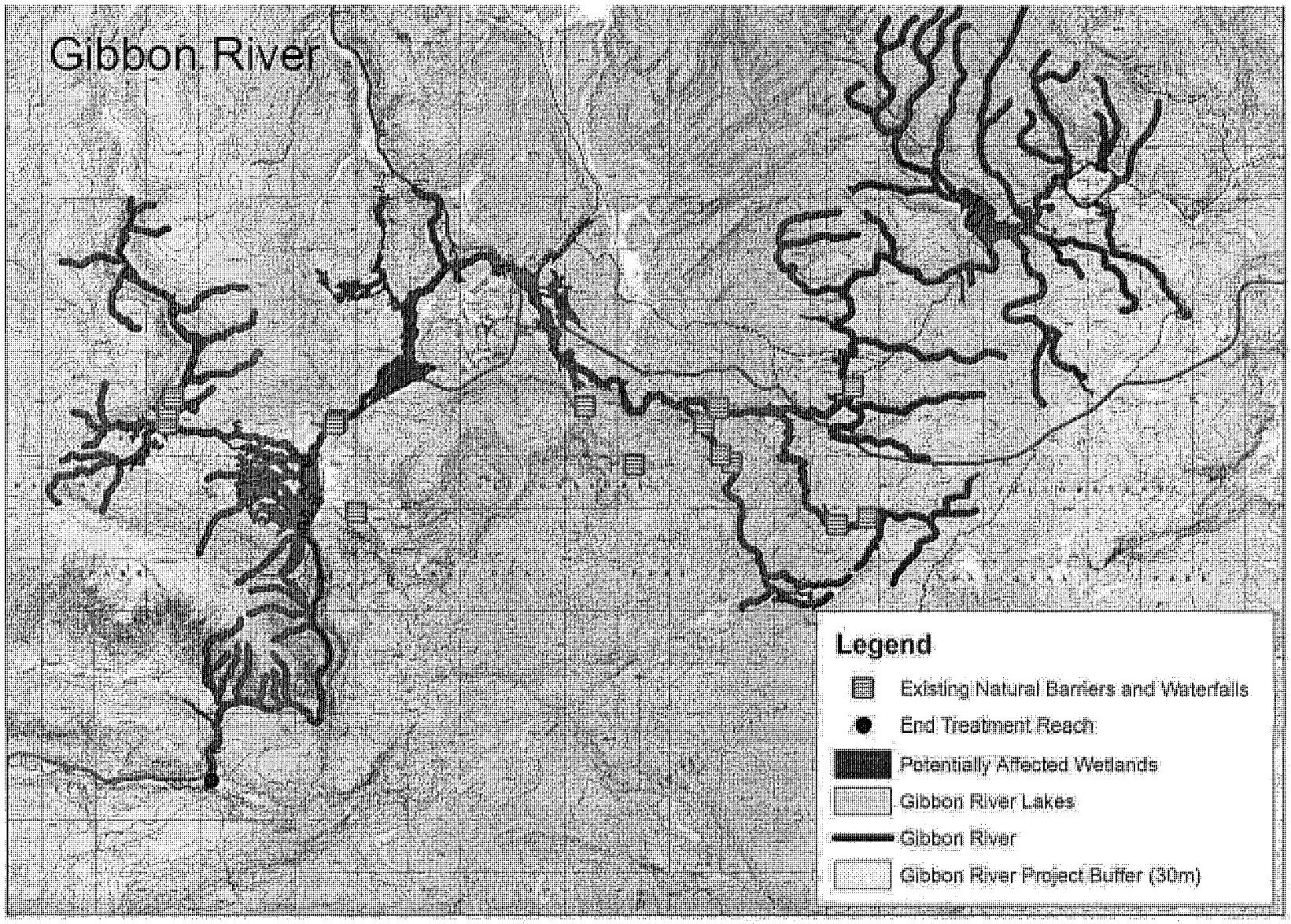


Figure 2. Gibbon River potential project wetlands.

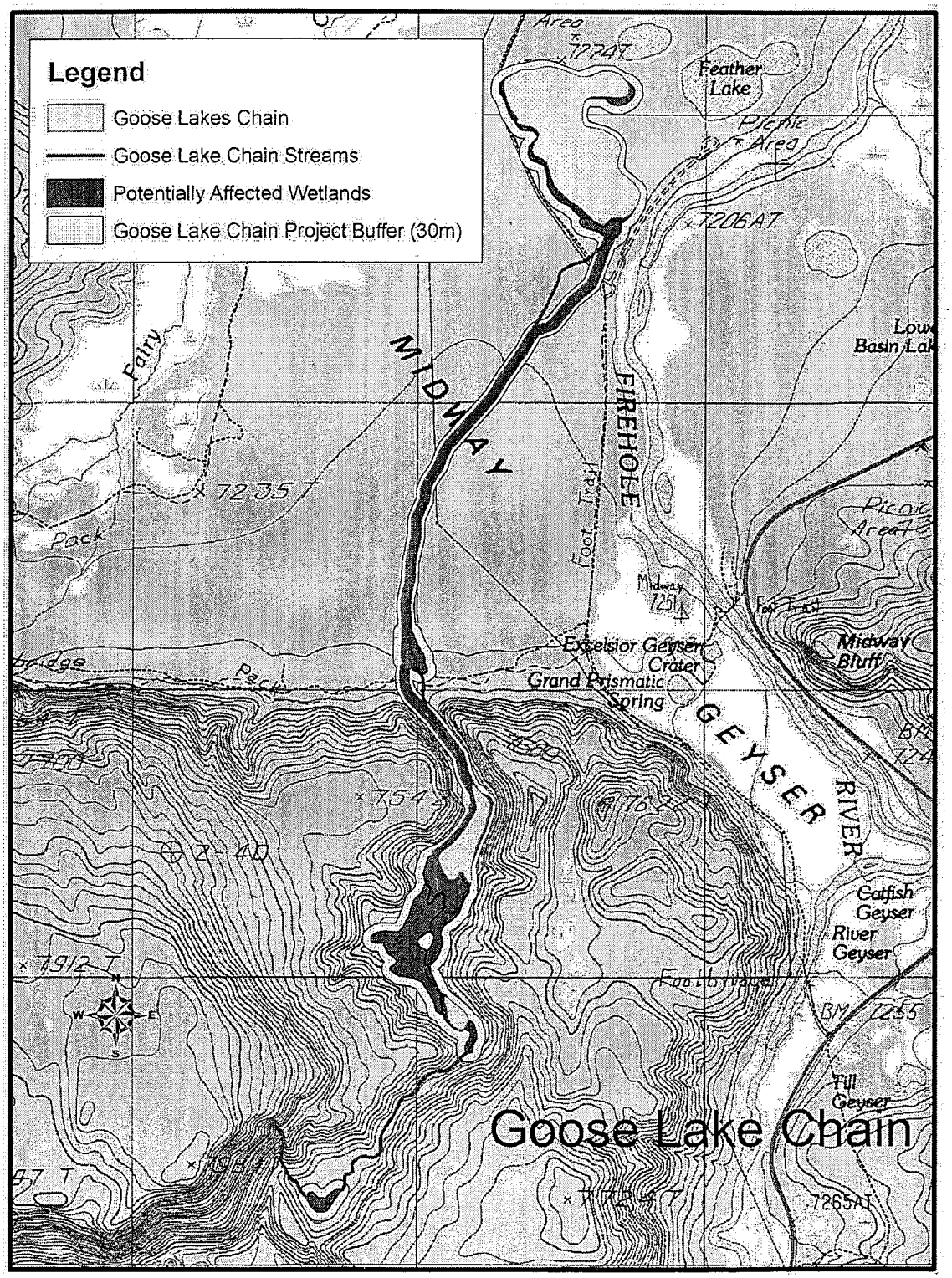


Figure G-14. Goose Lake Chain potential project wetlands. From USFWS NWI map data, 1998.

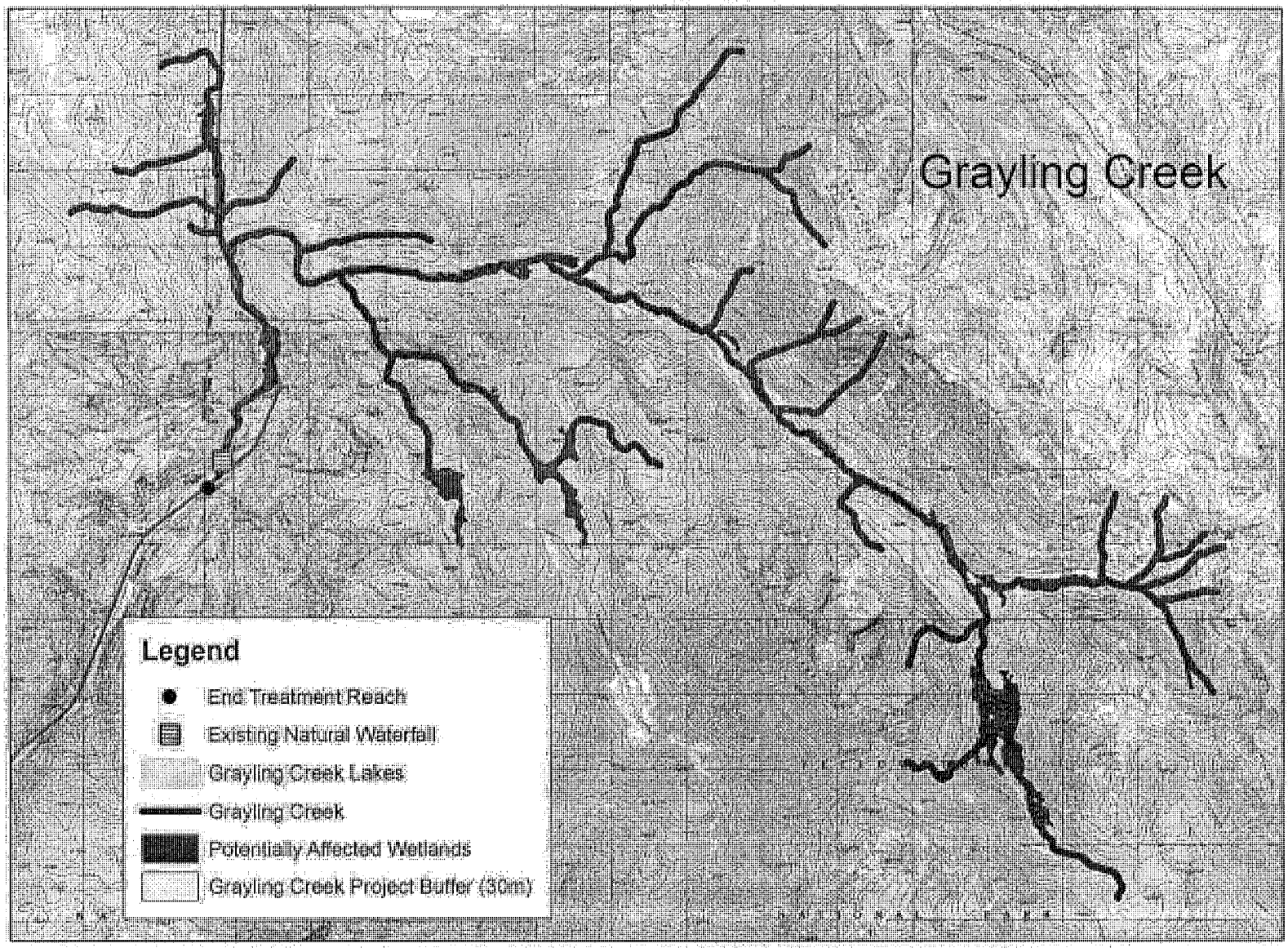


Figure G-15. Grayling Creek potential project wetlands. From USFWS NWI map data, 1998.

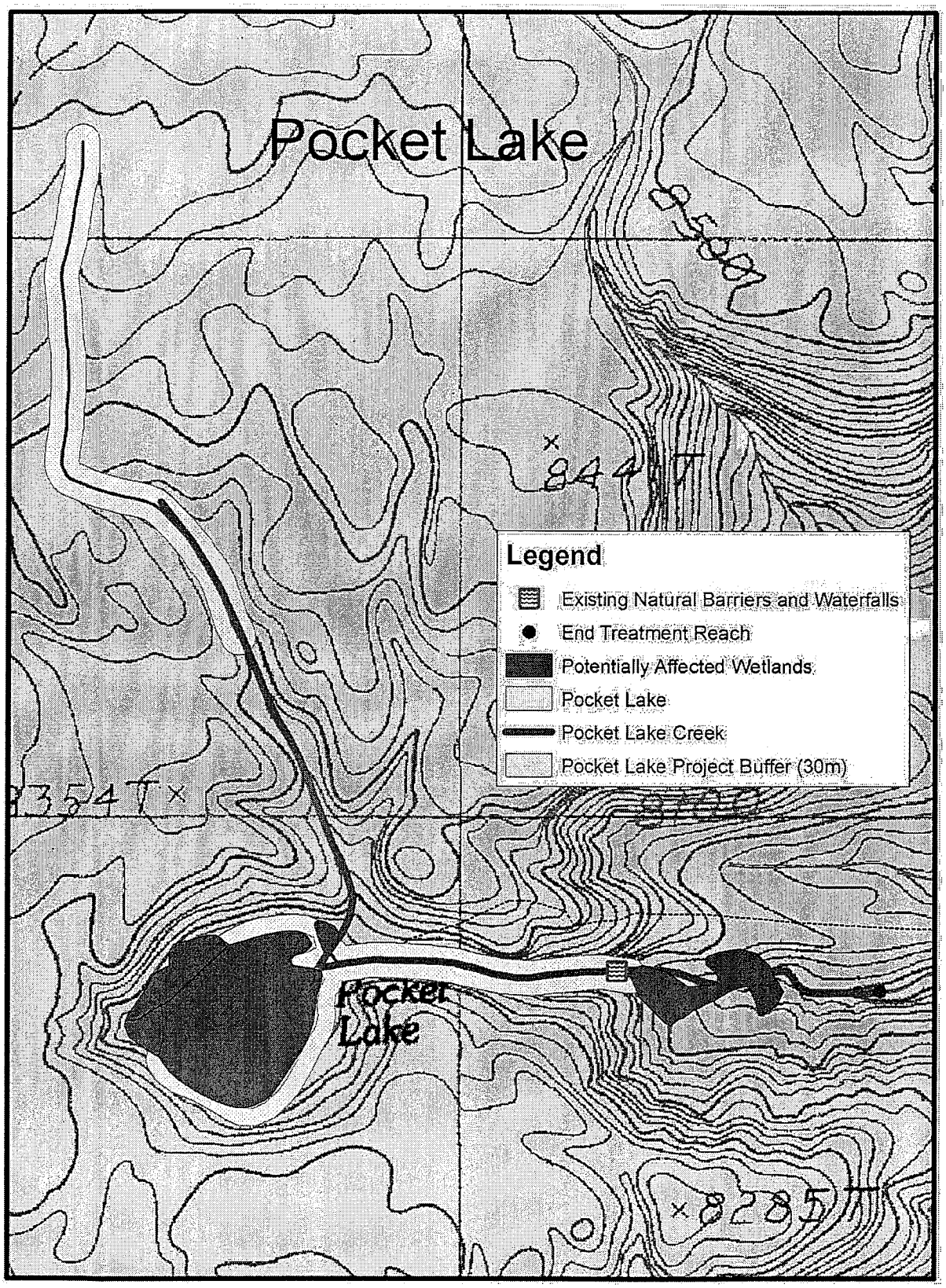


Figure G-16. Pocket Lake potential project wetlands.From USFWS NWI map data, 1998.

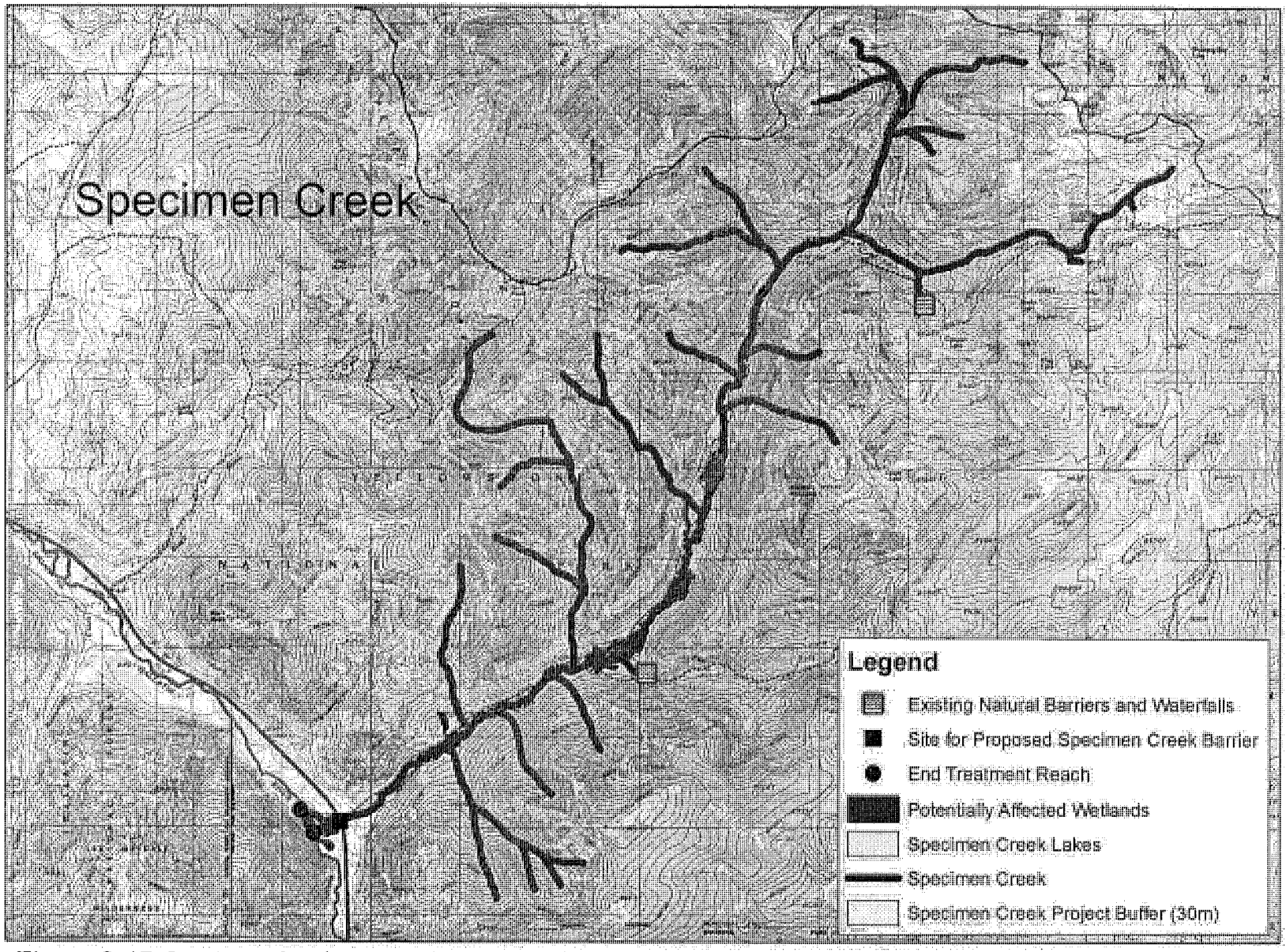


Figure G-17. Specimen Creek potential project wetlands. From USFWS NWI map data, 1998.

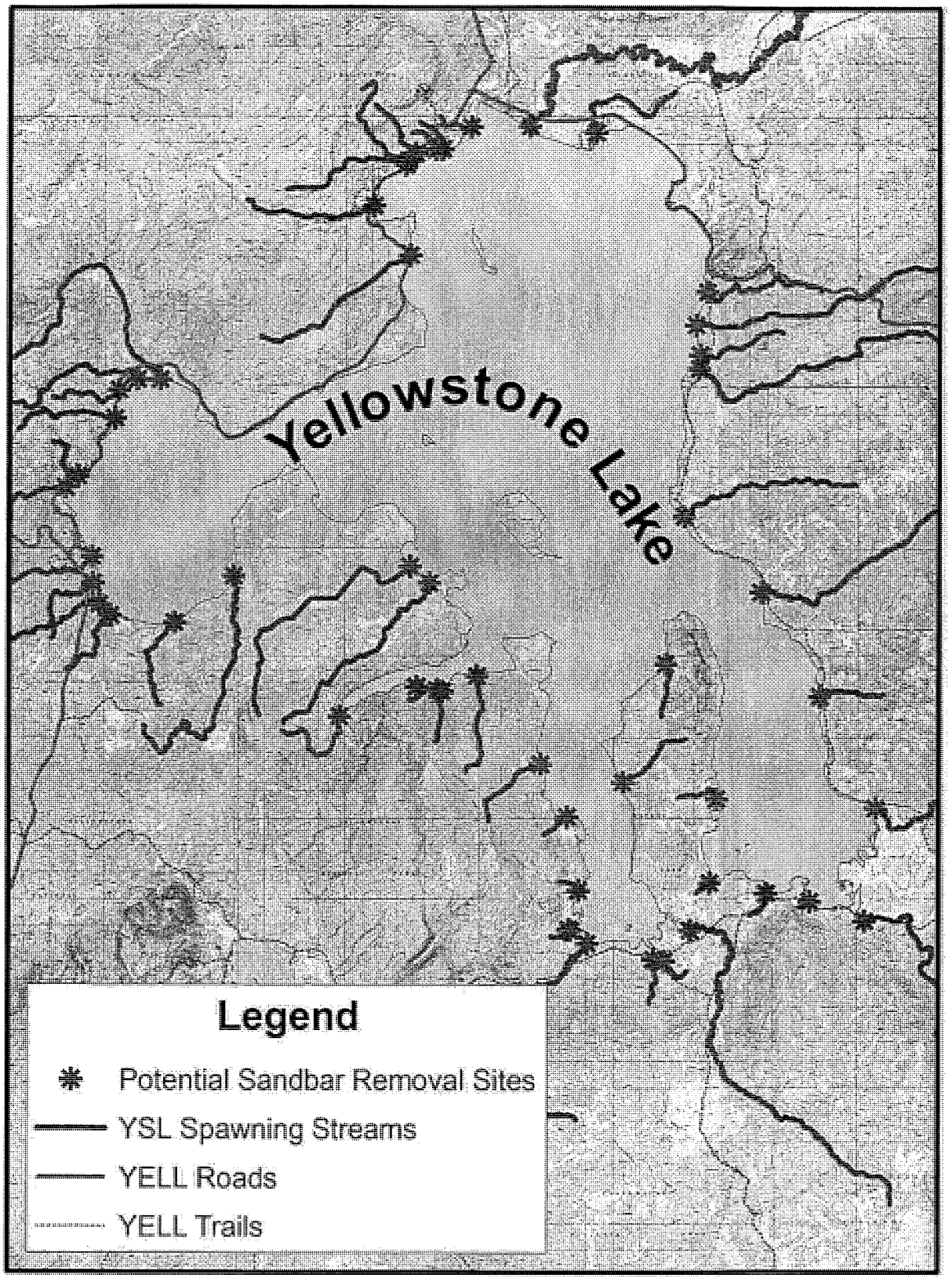


Figure G-18 Yellowstone Lake potential project areas (sandbar removal) highlighted by asterisks. From USFWS NWI map data, 1998.

THIS PAGE INTENTIONALLY LEFT BLANK