National Park Service
U.S. Department of the Interior
Yellowstone National Park

Restoration of Westslope Cutthroat Trout in the East Fork Specimen Creek Watershed

Environmental Assessment

May 5, 2006

Note to Reviewers and Respondents:

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Address for written comments:

Superintendent
Restore Westslope Cutthroat Trout Project
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Comments are due by midnight, June 7, 2006.

Westslope cutthroat trout by Joseph R. Tomelleri, American Fishes

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INTRODUCTION

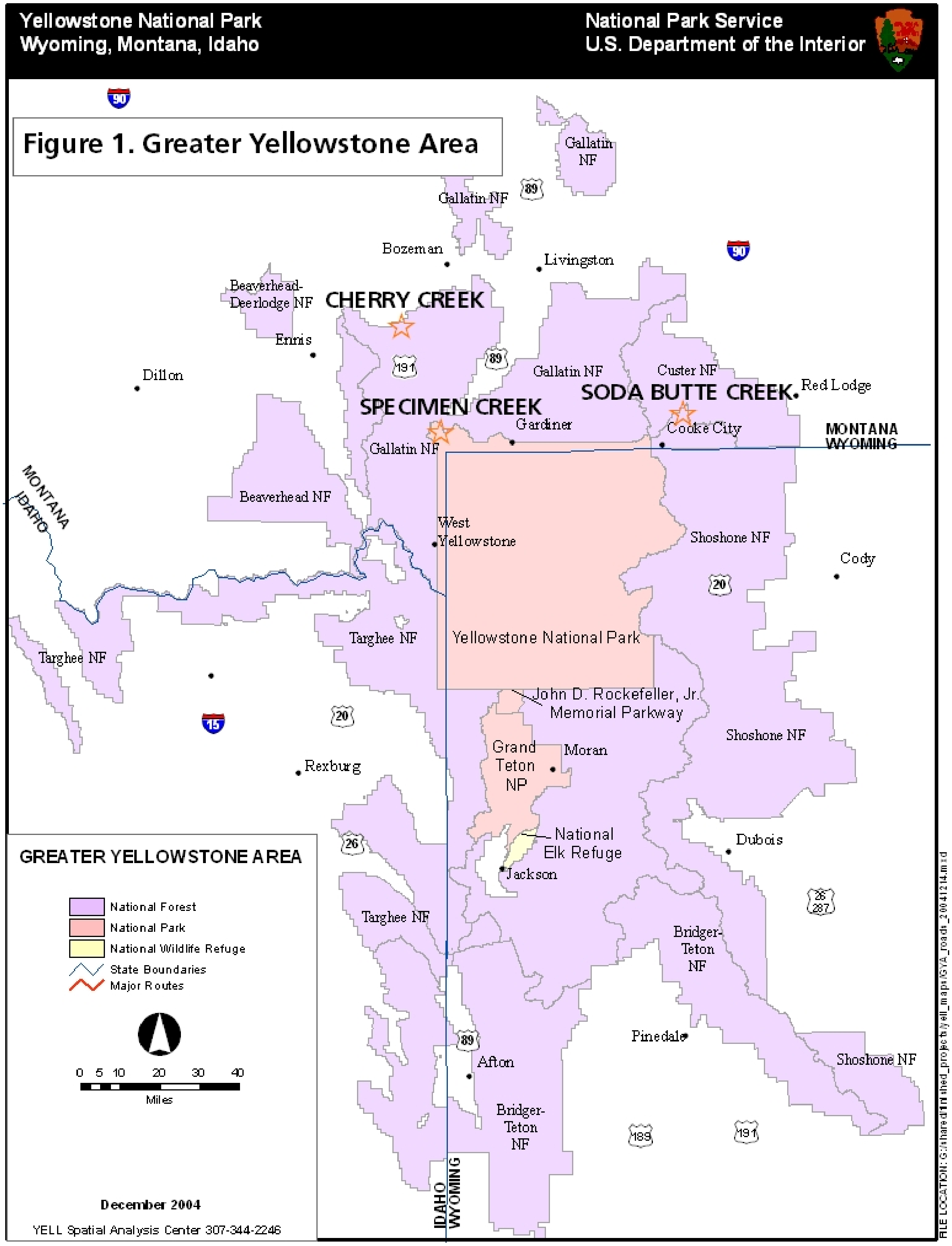
The National Park Service (NPS) proposes to restore native westslope cutthroat trout (*Oncorhynchus clarki lewisii*, WCT) in the East Fork Specimen Creek watershed in Yellowstone National Park (Yellowstone or park). By an Act of Congress on March 1, 1872, Yellowstone was "dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people" and "for the preservation from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders . . . and their retention in their natural condition." The world's first national park, Yellowstone:

- preserves geologic wonders, including the world's most extraordinary collection of geysers and hot springs and the underlying volcanic activity that sustains them;
- preserves abundant and diverse wildlife in one of the largest remaining intact wild ecosystems on earth, supporting unparalleled biodiversity;
- preserves an 11,000- year- old continuum of human history, including the sites, structures, and events that reflect our shared heritage; and
- provides for the benefit, enjoyment, education and inspiration of this and future generations.

Yellowstone encompasses 2,221,772 acres (3,472 square miles) and is located primarily in the northwest corner of Wyoming, with portions extending into southwest Montana and southeast Idaho. It is the core of the Greater Yellowstone Area (GYA), an approximately 12 million- acre area that includes Grand Teton National Park and John D. Rockefeller, Jr. Memorial National Parkway to the south, seven national forests, three national wildlife refuges, three Native American Indian reservations, state lands, towns and private property (Figure 1).

The NPS Organic Act of 1916 states that the NPS will "...conserve the scenery and the natural and historic objects and the wildlife therein and ... provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (NPS Organic Act 16 U.S. Code 1). The park is managed to conserve, perpetuate, and portray as a composite whole, the indigenous aquatic and terrestrial fauna and flora, the geology, and the scenic landscape. Sport fishing has an historical precedent in Yellowstone and has been a major visitor activity in the park for over 100 years. Yellowstone supports some of the world's most famous fisheries, and has been a destination for generations of anglers for over a century. However, as Yellowstone park managers have witnessed, and science has clearly demonstrated, nonnative species introductions from the late 1880s through the mid- 1900s resulted in the degradation (through hybridization) and losses of native cutthroat trout (*Oncorhynchus clarki* spp.) as well as native fluvial Arctic grayling (*Thymallus arcticus*).

The NPS 2001 Management Policies (NPS 2001), section 4.4.2, directs that all exotic (i.e., nonnative) species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if: 1) control is prudent and feasible; and 2) the nonnative species interferes with natural processes and the perpetuation of natural features, native species, or natural habitats. Section 4.4.2 also calls for the restoration of native animals when adequate habitat to support the species exists or can be reasonably restored. Conservation of stream communities and native cutthroat trout and controlling nonnative aquatic species was identified as a high- priority need in Yellowstone's Resource Management Plan (NPS 1998).


Yellowstone National Park
Wyoming, Montana, Idaho
National Park Service
U.S. Department of the Interior
Figure 1. Greater Yellowstone Area
Gallatin NF
Bozeman
Livingston
Beaverhead-Deerlodge NF
CHERRY CREEK
Ennis
Dillon
Gallatin NF
Custer NF
SODA BUTTE CREEK
Red Lodge
SPECIMEN CREEK
Gardiner
Cooke City
MONTANA
WYOMING
MONTANA
IDAHO
Beaverhead NF
West Yellowstone
Shoshone NF
Cody
Targhee NF
Yellowstone National Park
John D. Rockefeller, Jr. Memorial Parkway
Grand Teton NP
Moran
Rexburg
National Elk Refuge
Jackson
Dubois
Bridger-Teton NF
Pinedale
Afton
Shoshone NF
IDAHO
WYOMING
GREATER YELLOWSTONE AREA
National Forest
National Park
National Wildlife Refuge
State Boundaries
Major Routes
0 5 10 20 30 40
Miles
December 2004
YELL Spatial Analysis Center 307-344-2246

The proposed action would be a multi- year project consisting of:

- construction of an in- stream fish barrier and use of an existing natural waterfall to prevent upstream migration of competing nonnative species into WCT habitats
- removal of all fish from High Lake and East Fork Specimen Creek (EFSC) using approved piscicides, and
- introduction of genetically pure WCT in the watershed from other source populations, preferably from within the headwaters of the Gallatin and/or Madison river drainages.

BACKGROUND

Rangewide Status of WCT

Prior to environmental changes and nonnative fish introductions in the late 1800s and early 1900s, the abundance and distribution for WCT was the greatest of any cutthroat trout subspecies. The distribution once extended from the eastern slope of the Canadian Rockies (Hudson Bay drainage) south to the Salmon and Clearwater drainages of Idaho (Pacific drainage) and the upper Missouri River (Atlantic drainage) of Montana and extreme northwest Wyoming (Behnke 2002). It included both the east and west slopes of the Continental Divide, and also several large lakes (Pend Oreille, Coeur D' Alene, and Priest in Idaho, the Flathead in Montana, and Lake Chelan in Washington).

Similar to many other western North American salmonids, WCT populations have declined considerably throughout their historic range during the past century (Miller 1972, Liknes and Graham 1988, Behnke 1992). Numerous stressors, including habitat degradation and fragmentation from land use activities have reduced distribution and/or abundance of WCT. The subspecies currently occupies only 19- 27% of the historical range (both east and west of the Continental Divide) in Montana and about 36% of the historical range in Idaho (Shepard et al. 2003; Shepard et al. 2005). Even some of the historically most secure populations in Glacier National Park and the Flathead Basin of Montana are in serious decline (Marnell 1988). In the upper Missouri River drainage, WCT now occupy less than 5% of their historical range (Shepard et al. 1997). The remaining populations persist as small- stream residents occupying isolated habitats ranging from several hundred feet to a few miles in extent. As a result, these populations face a high risk of extinction.

The current status of WCT has led the Montana Natural Heritage Program (MNHP) to rank them as "S2:" at risk because of limited and/or declining numbers, range, and/or habitat making it vulnerable to extinction (MNHP 2004). The U.S. Fish and Wildlife Service (USFWS) has been petitioned to list WCT as threatened under the Endangered Species Act of 1973. Although the listing of WCT was found to be not warranted (USFWS 2000, USFWS 2003), the issue is currently being considered by U.S. District Court for the District of Columbia.

Interagency conservation actions to preserve remaining WCT and restore populations were described as a critical need in the original Montana WCT Conservation Agreement (Montana Fish, Wildlife and Parks (MFWP, 1999), and in two documents currently in development: the Montana Cutthroat Trout Memorandum of Understanding and Conservation Agreement (Montana Cutthroat Trout Steering Committee 2006) and the Status and Conservation Needs for WCT in Southwest Montana (MFWP 2006). Agencies and non- governmental organizations in Montana are developing conservation strategies that include three categories:

- Core populations — WCT that have no evidence of genetic introgression. These populations have not been hybridized and can serve as donors of fish or gametes for restoration efforts.
- Conservation populations — all of the core populations, plus populations that are <10% hybridized, have unique ecological and behavioral traits, and are phenotypically typical of the subspecies.
- Sportfish populations — wild or hatchery- sustained populations that are managed primarily for the benefit of recreational fisheries.

These classifications provide a framework for the conservation of WCT and are consistent with the two strategies being used in the western U.S. to conserve cutthroat trout (Shepard et al. 2005).

- The first strategy emphasizes the conservation of genetic integrity by isolating cutthroat trout populations that have no evidence of genetic introgression to prevent future introgression. The isolation is accomplished by use of a natural barrier (waterfall) or construction of an in- stream barrier. The smaller, isolated cutthroat trout populations will be more susceptible to population- level risks due to isolation, small population size, and temporal variability. However, their isolation makes them less susceptible to risks from genetic introgression, competition and predation by introduced fish species, risks of invasion and impacts of aquatic nuisance species, and the introduction of diseases.

- The second strategy emphasizes maintaining metapopulations (i.e., gene flow connectivity among one or more smaller populations) by protecting large areas of contiguous habitat, thus allowing cutthroat trout the best opportunity to express all life-history traits, especially migratory life- histories. While metapopulations will be less vulnerable to population risks such as temporal variability, isolation, and small population size, their connectedness makes them more susceptible to risks from genetic introgression, aquatic nuisance species introductions, and the potential for disease.

Thus, risks inherent in these two different conservation strategies are dramatically different. Implementing these two conservation strategies in concert should ensure the long- term persistence of WCT (Shepard et al. 2005).

Status of WCT within Yellowstone

Unlike many other areas within the historical range of WCT, habitat degradation and excessive harvest rates by anglers are not responsible for the subspecies decline within the park. Rather, the extensive stocking of nonnative competing species including brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) and interbreeding nonnative rainbow trout (*O. mykiss*) and introduced Yellowstone cutthroat trout (*O. clarki bouvieri*, YCT) during the first half of the twentieth century led to a serious reduction in the park's resident WCT, and in their near extinction from most park streams by the 1930s (Varley and Schullery 1998). YCT are native to the Yellowstone Lake and Snake River drainages but were introduced to several headwater streams in the upper Missouri River drainage in the early 1900s. Because stocking records were not always complete or accurate, the genetic status of many local populations was initially unknown or unverified (Liknes 1984). Recent surveys and the development of high resolution molecular analysis techniques, however, have indicated that genetically pure WCT appear to be extinct throughout much of their range, especially in the upper Missouri River drainage (Shepard et al. 2003; Shepard et al. 2005).

Recent analyses suggest that approximately 641 stream miles within the park originally supported genetically pure WCT. They have been extirpated (lost) from an estimated 36% of stream (231 miles) and exist in a hybridized form in most of the remaining 64% of stream (410 miles; NPS unpublished data 2005).

Survey efforts within the park from 1994 to 2003 were directed toward obtaining additional information about what was then thought to be the only remaining genetically pure WCT population, located in North Fork Fan Creek (Figure 2). Life history (radiotelemetry) studies (Zale 2003), habitat inventories, macroinvertebrate assessments, and water quality surveys were completed on this system, and the most appropriate site for an in- stream fish barrier was selected for stabilization and long- term protection of the WCT there. However, additional genetic analyses in 2003 revealed previously undetected rainbow trout alleles in the North Fork Fan Creek population (Koel et al. 2004). The North Fork Fan Creek WCT is now considered a “conservation population” rather than a “core population” as originally thought. Consequently, the park re- evaluated other watersheds in the park that previously supported WCT to determine which would provide the highest probability for successfully restoring a viable, genetically pure population of WCT.

In 2005, the park received information from a U.S. Forest Service Ranger (USFS) at the Hebgen Ranger District about an extremely isolated WCT population in an unnamed tributary to Grayling Creek (Madison River drainage). Since then, park biologists have determined that >700 trout reside there (Ruhl and Koel 2005). Through collaboration with the Idaho Department of Fish and Game Eagle Fish Genetics Lab, the park has confirmed that the population is 100% genetically pure and constitutes a “core population.” This is the only known genetically pure WCT population in the park and it exists in less than two miles of habitat (Ruhl and Koel 2005).

The subterranean nature of the unnamed tributary to Grayling Creek and the placement of a roadbed prior to any introductions of rainbow trout there have served to isolate and preserve the genetic integrity of the WCT population. The tributary originates in a spring- seep area located in the wilderness just west of the park boundary and flows eastward through pristine habitat for nearly two miles (Figure 2). The tributary then flows underground for more than one mile before reaching Grayling Creek. The abandoned roadbed constructed during 1910- 1911, fills the creek’s ravine without a culvert to a height of 40 feet just upstream from Grayling Creek. YCT were not introduced to Grayling Creek by early park managers, and construction of the roadbed predated the stocking of rainbow trout which began in 1923 (Varley 1981).

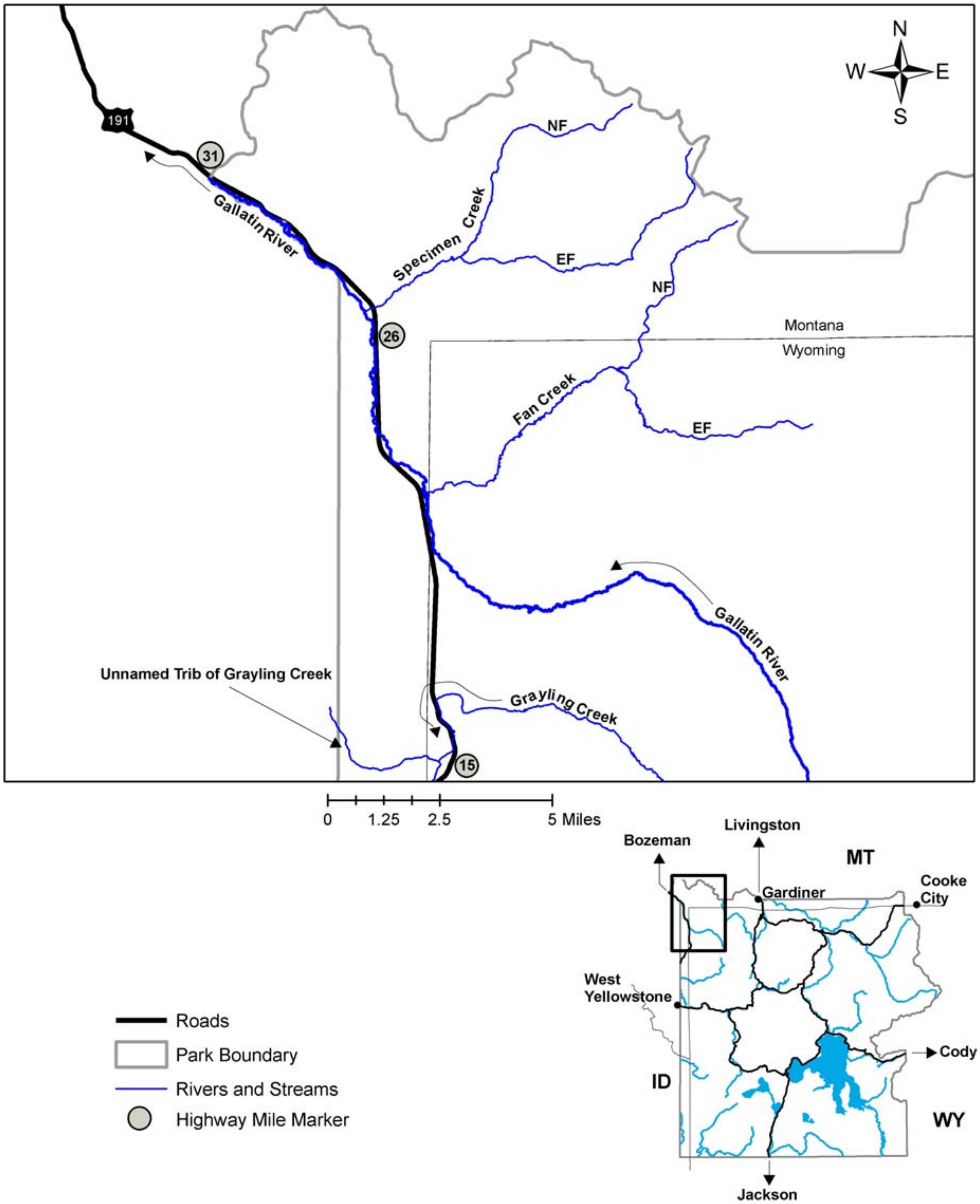


Figure 2. Unnamed tributary of Grayling Creek and Specimen Creek East Fork (EF) and North Fork (NF).

East Fork Specimen Creek as a Focus for WCT Restoration

A requirement for WCT restoration is that the watershed be large enough to support a population that would remain resilient when faced with natural disturbance by drought, fire, and/or flood. The Specimen Creek watershed meets these criteria. This watershed, which includes the EFSC and the North Fork Specimen Creek, originates in the high, rugged Gallatin Mountain Range (Figure 2). Several small headwater lakes and spring seeps feed both forks as well as several, smaller unnamed tributaries. Due mostly to natural barriers to fish movement upstream, these lakes were historically fishless. In 1937, however, NPS stocked these lakes with YCT, which are not native to the upper Missouri River drainage (USFWS 1971, Varley 1981). These fish have moved downstream, while rainbow trout from the Gallatin River have moved upstream into the watershed. Interbreeding among these species has resulted in a substantial loss of the native, pure WCT genetics. The EFSC watershed currently supports a highly hybridized (<80% pure) WCT population (Koel et al. 2003) that is not a core or conservation population.

The EFSC contributes nearly twice the flow and supports approximately twice as many trout as the North Fork. In addition, High Lake, a headwater lake to the EFSC, is the only lake in the Specimen Creek watershed stocked with YCT in 1937 that has continued to support YCT without additional stocking. The YCT in High Lake came from the Bozeman, Montana, Fish Hatchery (Varley 1981), and the current population is not a unique form warranting preservation. They have, in fact, resulted in the degradation of WCT within the EFSC watershed and their removal would be required as a part of any WCT restoration attempt there. There are many other high mountain lakes in the Intermountain West that contain stocked YCT populations, including lakes within protected national park or wilderness areas. Due to the significant productive potential of High Lake and its greater overall contribution of flow (habitat availability) and trout abundance, EFSC was chosen over the North Fork as the focus for WCT restoration within the park.

Sources for Genetically pure WCT

The genetically pure WCT population in the unnamed Grayling Creek tributary provides an exceptional opportunity for enhancement of this subspecies in Yellowstone. This isolated WCT population has many of the aspects of an unexploited fishery, including a wide range in size structure (Ruhl and Koel 2005). Given the life history strategy adapted by these fish, which involve only a very limited amount of movement among habitats each year, the population would be an excellent source for replication into a similar headwater system such as the EFSC.

Additional potential sources of genetically pure WCT for the proposed project include the recently developed brood stock at the Sun Ranch in the Madison River valley (Drake 2003) in Gallatin County, Montana, the WCT brood stock held at Washoe Park State Trout Hatchery, Anaconda, Montana, and, potentially, the WCT population in the North Fork Fan Creek within the park (Koel et al. 2005) (Figure 2). Although the Sun Ranch WCT are also needed for several other purposes, the prospects for eggs/fry being available for the EFSC restoration remain very high (Sun Ranch WCT Steering Committee, personal communication, December 2005). The park would continue to monitor the North Fork Fan Creek WCT population to track any potential changes in genetic purity. Analyses have indicated 99.8% genetic purity among alleles examined for rainbow trout introgression in the North Fork Fan Creek (NPS unpublished data, 2005).

Potential of High Lake as a WCT Refugia

High Lake is at the headwaters of EFSC and is a 7.1 surface acre, 19.4 feet maximum depth, sub-alpine lake resting at 8,500 feet or 2,600 meters (m). An outlet stream on the south shore serves as a primary source of flows for the EFSC. High Lake was historically fishless because a natural 15- foot waterfall located approximately 200 yards downstream from the High Lake outlet prevented fish from accessing High Lake from below the waterfall.

For introduced WCT, High Lake would serve as a significant buffer to potential watershed-scale natural disturbances such as wildfire, drought, and flood. Unlike EFSC or other similar stream systems, the lake environment is not prone to high or abrupt variation in flows, water temperatures, and other environmental conditions that have a strong influence on cutthroat trout survival. High Lake would provide a secure refugia and a source of WCT for the EFSC through emigration (downstream movement) by fry and adults.

Potential of an Artificial Fish Barrier for Isolating a Headwater WCT Population

Artificial fish barriers constructed to prevent the upstream movement of nonnative and hybridized trout and protect headwater populations of imperiled native fish species have been used successfully in many locations including several national parks (Thompson and Rahel 1998, Novinger and Rahel 2003, Shepard, in press). The structures allow for the isolation and protection of native fishes without depending solely on the presence of natural barriers (waterfalls) to fish movement. This greatly increases the available options and overall probability of success for fish restoration projects, in part because the native fish are re- introduced into previously occupied waters within their historical range. It also means that historically fishless waters, usually located above waterfalls (and outside of the historical range of the species), are not the only habitats available for native fish restoration projects.

In Crater Lake National Park, a barrier was constructed on Sun Creek to isolate a native bull trout (*Salvelinus confluentus*) population threatened by nonnative eastern brook trout (*S. fontinalis*) located downstream (Buktenica, in press). In Rocky Mountain National Park, fish barriers have been constructed for preservation/restoration of native greenback cutthroat trout (*O. c. stomias*; Stevens and Rosenlund 1986, USFWS 1998) and Colorado River cutthroat trout (*O. c. pleuriticus*; Rosenlund et al. 2000). More recently, a barrier was constructed on Quartz Creek in Glacier National Park to prevent the upstream movement of nonnative lake trout (*S. namaycush*) into the Quartz Lake chain of lakes, which are waters considered to be a last stronghold for bull trout in the park (B. Michels, Glacier National Park Biologist, personal communication, 2006). At present, 52 tributaries to the Great Lakes in Canada and 19 tributaries in the U.S. have fish barriers to prevent the upstream movement and spawning by nonnative sea lamprey (*Petromyzon marinus*) (University of Guelph 2002, Dodd et al. 2003).

The use of artificial fish barriers represents the best available technology for preventing invasion by nonnative and hybridized trout into a restoration area, especially one in a remote location. In instances where native cutthroat trout are immediately threatened by nonnative fish species, research has shown that isolation by artificial barrier construction may be the only alternative (Novinger and Rahel 2003). A study of tributaries to the Great Lakes indicated that small, low head fish barrier structures did not significantly alter stream habitats, although they may create habitat that favors certain species or provides refuge from predators (University of Guelph 2002, Dodd et al. 2003). No comparative studies have been published on the effects of fish barriers on stream habitats in the Intermountain West.

PURPOSE AND NEED

The purpose of the proposed project is to create a new, protected WCT core population to lower the overall risk of extinction of WCT in the upper Missouri River drainage of southwest Montana. The restoration efforts need to occur as soon as possible, while genetically pure WCT sources are available. It has been estimated that less than 1,000 genetically pure WCT remain in the park, and they exist within an isolated stream reach of less than 2 miles. This population is highly vulnerable to stochastic (i.e., random) events and must be replicated before lost.

The project is needed to accomplish the following goals: (1) reduce long- term extinction risk for WCT within Yellowstone, and 2) provide a secure refugia for genetically pure WCT. High Lake has proven potential for supporting WCT without supplementation (stocking) because it previously supported an introduced population of YCT. High Lake would serve as an upstream source for WCT and would be protected by natural and constructed barriers to provide a secure refugia in case of failure of the artificial fish barrier on EFSC or watershed- scale wildfire, drought and/or flood.

IMPACT TOPICS CONSIDERED

Impact topics are the resources of concern that could be affected by the proposed range of alternatives. A park interdisciplinary team identified issues and concerns during internal scoping and through comments received during public scoping. These issues and concerns, combined with federal laws, regulations, orders, and NPS 2001 Management Policies led to the development of the following impact topics analyzed in this EA:

- Health and Human Safety
- Water Quality
- Wetlands/Waters of the U.S.
- Fish and Wildlife
- Species of Concern
- Wilderness
- Socioeconomic Resources
- Visitor Use including Recreation and Angling

IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

The following impact topics were dismissed from further consideration based on the park interdisciplinary team assessments and lack of concern identified during the November 2005 public scoping.

AIR QUALITY

The Clean Air Act, as amended, recognizes the need to protect visibility and air quality in national parks. As mandatory Class I areas, national parks are given the highest level of air quality protection. In Class I airsheds, air quality is better than the National Ambient Air Quality Standards and there is little allowance for any deterioration. Because there is little industrial activity and relatively low population outside the park in northwest Wyoming and south- central Montana, the overall regional air quality of the park is good. The major sources of air pollutants in the park are vehicle emissions and smoke from wildland fires. Proposed project activities will not exceed federal, state or local ambient air quality standards. Impacts to air quality are anticipated to be direct, short- term, and negligible adverse.

CULTUAL RESOURCES

Archeological/Historic Resources

The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.) (NHPA), and the NPS Director's Order- 28, Cultural Resource Management Guideline (DO- 28), require the consideration of impacts on cultural resources listed in, or eligible for listing in, the National Register of Historic Places.

At least 11,000 years before present, during the Paleoindian Period, small, highly mobile human groups were present in the Yellowstone region. These groups used crafted stone weapons and tools to pursue and utilize large game. Left behind are Clovis, Folsom, and Cody Complex sites, consisting of camps and quarry remains and sites where animals were killed. The Archaic Period in Yellowstone was characterized by mobile groups who utilized a greater variety of plant foods and small game. The park area was most heavily used by these groups during the Late Archaic, from 1000 B.C. to A.D. 200. Later sites in the park may have been used by small groups who resided in lower valleys outside the park, and sent parties into the area to hunt game and gather plant materials and other subsistence items. Archeological sites from this time include tipi rings, hunting blinds, and lithic scatters.

Although archeological surveys have not been conducted in the project area, the park's archeologist has determined the probability that archeological resources would exist in the project area is very low because humans would not have camped on the high moisture soils around the High Lake outlet or along the steep, rocky and deeply incised stream. Impacts are anticipated to be direct, long- term, and negligible adverse. The park will submit the EA to the Montana State Historic Preservation Office (MTSHPO) for compliance with the NHPA.

Paleontology

A petrified forest is present throughout the Absaroka volcanic rocks in the EFSC watershed. Most of this petrified wood is contained within the banks. The fish barrier, splashpad, and upstream ponding would be placed to avoid large pieces of petrified wood. Impacts to smaller petrified wood pieces would be direct, long- term, and negligible adverse.

Cultural Landscapes

According to the NPS DO- 28, a cultural landscape is ". . . a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use, reflecting cultural values and traditions." Cultural landscapes provide a visual chronicle of an area's human history. Human developments may occur spontaneously or formally, such as for a historic designed landscape. There are no known patterns of settlement or structures within the EFSC watershed, and therefore, no cultural landscapes.

Ethnographic Resources

The NPS 2001 Management Policies defines ethnographic resources as "the cultural and natural features of a park that are of traditional significance to traditionally associated peoples." Traditionally associated peoples have an association with the landscape before it became a park, and include, in the case of Yellowstone, at least 26 American Indian tribes, each having particular historical traditions associated with Yellowstone. A number of tribes were historically present in the area on at least a seasonal basis, including the Bannock, Blackfeet, Crow, Kiowa, Nez Perce, Salish, and Shoshone.

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) would be followed. Project work would cease immediately and the NPS would consult with the affected tribe(s) and the MTSHPO, if necessary, regarding the resources and the project. The location of any such ethnographic sites would remain confidential.

THREATENED AND ENDANGERED SPECIES

Four animal species in Yellowstone are listed as threatened under the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.): the grizzly bear, gray wolf, Canada lynx, and bald eagle. The park will complete an informal Section 7 consultation with the USFWS for effects to listed species prior to implementing the project.

Grizzly bear

The grizzly bear (*Ursus arctos horribilis*) can be found in all habitat types within the park. They are solitary opportunistic omnivores except during breeding and cub rearing, and require energy- rich food of protein and/or carbohydrates to survive pre- and post- denning periods. Since the mid- 1990s, the Yellowstone population has grown at a rate of 4- 7% per year. An estimated 600 grizzly bears now occupy the GYA. In November 2005, the USFWS proposed delisting of the Yellowstone Grizzly Bear Distinct Population Segment. The USFWS has approved grizzly bear management plans for the states of Wyoming, Montana, and Idaho. Critical habitat has not been proposed or designated for the grizzly bear.

Grizzly bears inhabit the project area during spring, summer, and to a lesser extent, fall, to forage on carrion, herbaceous vegetation, and fruits. Grizzly bears are most common along the mainstem Specimen Creek and the lower reaches of the North Fork and EFSC. The project area is not within a Yellowstone Bear Management Area. The piscicides antimycin and rotenone and neutralization agent, $KMnO_4$ are not known to be toxic to large mammals at the concentrations in water used to remove fish (USFWS 2005). Fish carcasses in the EFSC would be collected and transported out of the park to avoid attracting grizzly bears to the area and bear- human conflicts. The air bladders of the fish carcasses that rise to the top of High Lake would be punctured and returned to the bottom of the lake to reduce attraction of grizzly bears to the area. Grizzly bears are not known to feed on fish in this watershed and would not be impacted by loss of prey during the project (K. Gunther, Yellowstone Bear Management Specialist, personal communication, 2006). Because most project activities would occur in the lake or at the barrier site in the stream, the possibility of displacement would be slight. The fish barrier would not impede grizzly bear movements due to its small size. Impacts are anticipated to be direct, short- term, and negligible adverse.

Gray wolf

The gray wolf (*Canis lupus*) is the largest member of the Canid family, with adults weighing between 40- 175 pounds. Predator control by local, state, and federal governments beginning in the late 1800s and early 1900s resulted in its extirpation from the GYA and most of the lower 48 states by the 1930s. In 1995 and 1996, gray wolves were reintroduced in Yellowstone and classified as a “nonessential experimental” population under section 10(j) of the Act. Within the

National Wildlife Refuge System and national park units, nonessential experimental populations are treated as a threatened species under the Act, and all provisions of the Act apply (50 CFR 17.83(b)). The USFWS published a final rule to reclassify and delist the gray wolf in portions of the lower 48 states (including the park) in 2003, pending approval of state management plans. FWS has approved the Montana and Idaho management plans of Montana and Idaho, but not that of Wyoming. Critical habitat has been designated in portions of Michigan and Minnesota but has not been proposed or designated within the park.

At the end of December 2005, at least 118 wolves in 14 packs occupied the park. The Specimen Creek watershed lies between two wolf pack territories: Cougar Creek II pack to the south and west and Swan Lake Pack further to the east. Wolf use of the Specimen Creek watershed is likely moderate as wolves move, hunt and disperse in the watershed. The piscicides antimycin and rotenone are not known to be toxic to large mammals at the concentrations in water used to remove fish (USFWS 2005). The fish barrier would not impede wolf movements due to its small size. Fish carcasses would be disposed of as soon as possible to avoid attracting gray wolves to the site, wolf habituation and conflicts with humans. Potential impacts are anticipated to be direct, short- term, and negligible adverse.

Canada lynx

The Canada lynx (*Lynx canadensis*) is a medium- sized felid with long legs and large feet—adaptations that facilitate travel through deep snow (Koehler and Aubry 1994). The species is primarily associated with boreal forests in Canada and Alaska, but its southerly range extends into the northern portion of the continental U.S. In the Rocky Mountains, including the GYA, Canada lynx are primarily associated with scattered patches of boreal- like subalpine forests that support heavy snow pack and snowshoe hares (*Lepus americana*), their principal prey.

The USFWS listed the Canada lynx as threatened in the lower 48 states in April 2000. In November 2005, Critical habitat was proposed for Canada lynx in portions of northern Maine, northeast Minnesota, the northern Rocky Mountains (northwest Montana and a small portion of northern Idaho), and the Okanogan area of the northern Cascades in north- central Washington. None of the GYA including the park was included in the proposal.

In January 2000, an interagency Canada Lynx Conservation Assessment and Strategy (CLCAS) was completed and approved by the USFWS, the USFS, and Bureau of Land Management (Ruediger et al. 2000). In accordance with the CLCAS, the park identified 20 Lynx Analysis Units (LAUs) by overlaying the primary and secondary habitat coverage on watershed boundaries defined by hydrologic unit codes.

The Specimen Creek LAU is 80,180 acres in size, of which 43,180 acres is defined as lynx habitat. Approximately 43% of this potential lynx habitat is currently in an unsuitable condition. The project area contains habitat mapped as suitable for lynx. Lynx were not documented in this area during tracking surveys conducted from 2000- 2004. The piscicides are not known to be toxic to mammals at the concentrations in water used to remove fish (USFWS 2005). The fish barrier would not impede movements of any lynx due to its small size. Fish carcasses would be disposed of as soon as possible to avoid attracting lynx to the site. Impacts to an individual lynx from displacement are anticipated to be short- term, direct and negligible adverse. The permanent in- stream fish barrier would result in the removal of less than 0.2 acres of habitat mapped as suitable for lynx, resulting in a negligible adverse impact.

Bald eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large raptor weighing 6- 14 pounds, with a wingspread of 7- 8 feet. Bald eagles are typically found around and along lakes and riparian corridors in the park, and require large isolated areas, free from disturbance by human activities. They are most sensitive to disturbances from humans during nest building, incubation, and early brood rearing (Steidl and Anthony 2000). Availability of food, nest trees, and suitable perches, and security from human activities within 2 miles of open water are primary components for successful nesting productivity.

The bald eagle historically ranged throughout North America except in extreme northern Alaska and Canada, and central and southern Mexico. An estimated 250,000- 500,000 were present in the early 1600s. Loss of nesting and foraging habitat, the use of organochlorine pesticides such as diphenyltrichloroethane (DDT), shooting, trapping and poisoning, were the principal reasons for their decline to approximately 400 nesting pairs in the early 1960s. In 1978, the USFWS listed the species as endangered in the continental U.S. under the Act (Federal Register 6233) in all of the lower 48 states except Michigan, Minnesota, Oregon, Washington and Wisconsin, where it was designated as threatened. In July 1995, the FWS downlisted the bald eagle from endangered to threatened. In July 1999, the USFWS published a rule to delist the bald eagle but took no further action. The USFWS proposed delisting again on February 16, 2006. No critical habitat has been proposed or designated for the bald eagle under the Act.

Project activities (piscicide treatments in High Lake and EFSC) would begin during the last week of the bald eagle nesting season (February 1- August 15) (Greater Yellowstone Bald Eagle Working Group 1996). However, the closest known bald eagle nest is approximately 3 miles southwest of the project area along the Gallatin River near the mainstem Specimen Creek. Bald eagles would rarely, if ever, use High Lake for hunting or perching due to late thawing and early icing of the lake, and because of the angling and recreational use that occurs at High Lake during the summer (T. McEneaney, Yellowstone National Park Ornithologist, personal communication, 2006). The piscicides antimycin and rotenone are not known to be toxic to raptors at the concentrations in water used to remove fish (USFWS 2005). The proposed project would have direct, short- term, negligible adverse impacts to bald eagles.

FLOODPLAINS

Executive Order 11988 (Floodplain Management) requires all federal agencies to avoid construction within the 100- year floodplain unless no other practicable alternative exists. The NPS implements this Executive Order through Director's Order- 77- 2 (DO- 77- 2) and the accompanying Procedural Manual 77- 2 (PM 77- 2). DO- 77- 2 applies to all NPS actions and requires inclusion of a Statement of Findings in an EA if the proposed action results in an adverse effect to the natural resources and functions of a floodplain or increases flood risks.

The base floodplain of Specimen Creek lies on either side of the EFSC streambank (out of bank). The proposed fish barrier would be placed within the stream and extend into the riparian zone. Although this would not impact the floodplain, a very small area (< 0.031 acres) would be affected through pooling and submersion of riparian vegetation above the fish barrier, resulting in negligible adverse impacts. Riparian vegetation may emerge along the edge of the newly created streambank in an area previously covered by upland vegetation. Because the proposed project would not result in an adverse impact greater than negligible to the natural resources and functions of a floodplain or increase flood risks, the proposed action is excluded from DO- 77- 2/PM- 77- 2 and a Statement of Findings is not required.

HYDROLOGY

The EFSC drainage basin includes 8,467 acres (3,426 hectares) in the northwest corner of the park. Water originates from high Gallatin Mountain Range ridges (>9,000 feet) as snowmelt and rainfall percolated through a combination of confined aquifers (permeable bedrock) and unconfined aquifers (surficial alluvium such as soils and other surficial materials). The natural flow regime is characterized by a spring/early summer flood pulse followed by low flow periods in late summer, fall, and winter. Direct, short- term negligible adverse impacts would occur within the immediate vicinity from re- routing of the stream to construct the proposed in-stream fish barrier. Indirect, long- term, negligible adverse impacts to hydrology are anticipated from upstream ponding of water (0.122 acres). The upstream ponding would likely increase sediment deposition above the barrier and the falling water would potentially increase erosion in the immediate area below the barrier. The splashpad to be placed on the streambed immediately below the fish barrier would reduce erosion immediately below the barrier. Impacts from the splashpad are expected to be long- term, and negligible adverse. No impacts to hydrology outside of the immediate area of the barrier site are anticipated.

SOUNDSCAPE MANAGEMENT

The NPS policy on soundscape management is contained in Director's Order 47, Sound Preservation and Noise Management. The natural ambient soundscape is the aggregate of all the natural sounds that occur in a park, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and are transmitted through air, water, or solid materials.

Due to the sensitive and remote nature of the watershed, no heavy mechanized equipment would be used. Chainsaws would be used minimally to remove large diameter trees to construct the fish barrier. Two to four helicopter flights and landings would occur annually over a six-year period to transport supplies and/or fish to High Lake and the upper reaches of EFSC. Noise from outboard motors associated with the two rafts would occur over a 6- 8 week period during the first year High Lake is treated and for a 2- 3 week period during the second year of treatment. One or two generators may be used to power floodlights and mechanical pumps at the piscicide neutralization stations. Impacts would be direct, short- term and negligible to minor adverse. Noise impacts from project operations are analyzed as part of the attached Minimum Requirement Analysis (MRA, Appendix B) and under the *Wilderness* impact topic.

LIGHTSCAPE MANAGEMENT

The NPS 2001 Management Policies state that the NPS will preserve to the greatest extent possible "the natural lightscapes of the parks, which are natural resources and values that exist in the absence of human caused light." The project area is within the park's recommended wilderness and would not have any permanent artificial outdoor lighting. Temporary use of lighting would include lanterns, headlamps, and one or two floodlights to operate the neutralization stations at the High Lake outlet and in the EFSC. Six to twelve project personnel would be used to alternate staffing needs for the stations. Night lighting would be used during August and early September for three years. Impacts from the use of night lighting are analyzed in the MRA (Appendix B) and under the *Wilderness* impact topic. The lowest floodlight wattage necessary would be used and floodlights would be shielded to reduce glare and trespass light into the surrounding environment. Impacts to lightscapes would be direct, short- term, and negligible to minor adverse.

VEGETATION INCLUDING RARE PLANTS

Approximately 83 percent of the park is forested, mostly by lodgepole pine (*Pinus contorta var. latifolia*). This community is found in a variety of successional stages at elevations between 7,500 and 9,000 feet. Lodgepole communities cover approximately 1.4 million acres in the park.

The creek bisects a forest corridor dominated by lodgepole pine with spruce (*Picea engelmanii*) and Douglas fir (*Abies bifolia*) adjacent to the stream. The narrow streamside riparian/wetland zone has scattered alder (*Alnus* spp.), currant (*Ribes* spp.), willow (*Salix* spp.), bluebells (*Mertensia* spp.), twisted- stalk (*Streptopus amplixifolius*), cow parsnip (*Heracleum sphondylium*), and grasses and sedges (*Carex* spp.).

The construction and long- term use of the in- stream fish barrier would result in permanent impacts to an estimated 0.122 acres of riparian vegetation from anchoring of the barrier into the streambank and upstream ponding of water. Up to fifteen live large- diameter conifers, approximately 24 inches diameter breast height (dbh) would be removed from the nearby area to construct the barrier. No conifers would be removed within the riparian zone which extends approximately 50- 75 feet on either side of the stream. The proposed piscicides are not known to impact vegetation.

There are no known federally threatened or endangered plant species within the park. The park's botanist will survey the EFSC and High Lake project areas for rare plants prior to implementing the project. If any are detected that may be affected by the in- stream fish barrier, the splashpad, upstream ponding, and project staging areas, the location of the fish barrier would be adjusted to avoid any impacts to rare plants.

GEOLOGY AND TOPOGRAPHY

Yellowstone lies in a geologically dynamic region of the northern Rocky Mountains. Volcanism, glaciation, and ongoing physical processes explain many of its geologic features. Within the 640,000- year- old Yellowstone Caldera, numerous lava flows created heat from a partially molten magma chamber that drives Yellowstone's active hydrothermal features. Outside that caldera and another older caldera that is 2.1 million years old, rocks exhibit typical Rocky Mountain geology.

The Specimen Creek watershed lies outside both calderas in the northwest part of the park. The watershed consists of rocks older than 2.1 million years. Volcanic and volcaniclastic rocks from the Absaroka volcanism (approximately 50 million years ago) form most of the high terrain along the East and North Forks of Specimen Creek. During the last major glaciation (Pinedale glaciation), ice eroded the volcanic rocks and deposited various glacial, glaciofluvial, and lacustrine sediments within the Specimen Creek drainage (Pierce 1973; C. Jaworowski, Yellowstone National Park Geologist, personal communication, 2006). A large ice cap built up on the Yellowstone Plateau and a smaller ice cap formed in the uplands at the head of Specimen Creek (Pierce 1973). Ice from the northern outlet glacier of the Yellowstone Ice Cap flowed over a topographic divide and into the valleys of the East and North Forks of Specimen Creek at the Pinedale maximum. Ice then advanced down the valley of the East Fork to the junction with the North Fork and formed a terminal moraine (Pierce 1973). During the rapid glacial recession, the retreating ice formed a series of recessional moraines up the valley of the East Fork (C. Jaworowski, Yellowstone National Park Geologist, personal communication, 2006). In contrast, ice did not advance as far down the valley of the North Fork during the Pinedale maximum.

During the Pinedale maximum, glacial streams deposited outwash sediments within the broad, lower valley of the North Fork. This difference in Pinedale ice advance and retreat accounts for the differing topography, stream characteristics and sediments within the valleys of the East and North Forks. The construction of the in- stream barrier would affect an estimated 0.122 acres of streambank, resulting in direct, long- term, and negligible adverse impacts to geology and topography.

PRIME AND UNIQUE FARMLANDS

In August 1980, the Council on Environmental Quality (CEQ) directed federal agencies to assess the effect of their actions on farmland soils classified by the U.S. Department of Agriculture's Conservation Service as prime or unique. Prime farmland is defined as soil that produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. None of the soils in the project area are classified as prime and unique farmlands.

ENVIRONMENTAL JUSTICE

According to the U.S. Environmental Protection Agency (EPA), environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low- Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental impacts of their programs and policies on minorities and low- income populations and communities. None of the alternatives would have health or environmental impacts on minorities or low-income populations or communities as defined in the CEQ document *Environmental Justice: Guidance Under the National Environmental Policy Act*.

ALTERNATIVES CONSIDERED

Three alternatives are considered in this EA.

- Alternative 1 is the No Action Alternative. No action would be taken to remove nonnative and hybridized trout populations from the EFSC watershed and genetically pure WCT would not be restored into the EFSC watershed.
- Alternative 2 (Preferred Alternative) involves construction and long- term use of a fish barrier in EFSC, removal of nonnative and hybridized trout from EFSC including YCT from High Lake (headwater lake within the East Fork watershed) using approved piscicides, reintroduction of genetically pure WCT into EFSC, and introduction of genetically pure WCT into High Lake.
- Alternative 3 (Environmentally Preferred Alternative) involves construction and long-term use of a fish barrier in EFSC, removal of nonnative and hybridized trout from EFSC including YCT from High Lake using approved piscicides, and reintroduction of genetically pure WCT into EFSC. Under Alternative 3, genetically pure WCT would not be introduced into High Lake, resulting in a return of High Lake to its historically fishless condition.

Table 1 summarizes the alternatives and how each meets project goals.

Table 1. Comparative summary of alternatives.

	Alternative 1	Alternative 2 (Preferred Alternative)	Alternative 3
Components	No action.	• Construction of fish barrier • Removal of nonnative and hybridized trout • Reintroduction of WCT into EFSC • Introduction of WCT into High Lake	• Construction of fish barrier • Removal of nonnative and hybridized trout • Reintroduction of WCT into EFSC only
Summary	No action would be taken to remove nonnative and hybridized trout populations from the EFSC watershed and genetically pure WCT would not be restored into the EFSC watershed.	Nonnative fish/hybridized WCT would be removed through chemical treatment within EFSC, its tributaries and High Lake. Construction of a fish barrier at the downstream end of the East Fork and an existing waterfall below High Lake would isolate the system. Genetically pure WCT would be reintroduced to EFSC and introduced into High Lake. Through downstream drift, High Lake would serve as an important source of genetically pure WCT for all streams of this watershed.	Nonnative fish/hybridized WCT would be removed through chemical treatment within EFSC, its tributaries and High Lake. Construction of a fish barrier at the downstream end of the East Fork and an existing waterfall below High Lake would isolate the system. Genetically pure WCT would be reintroduced to EFSC. Genetically pure WCT would not be introduced to High Lake, resulting in a return of this lake to its historically fishless condition.
Project goal 1: **Reduce long-term extinction risk for WCT in Yellowstone.**	**Goal would not be met** because the long-term risk of WCT extinction in Yellowstone would remain high.	**Goal would be met** because risk of long-term extinction of WCT in the park would be greatly reduced through reintroduction of WCT into EFSC and introduction into High Lake. High Lake would serve as an upstream source for WCT and would better ensure population persistence within the watershed.	**Goal would be met** because genetically pure WCT would be reintroduced into EFSC. Risk of long-term extinction in the park would be somewhat reduced, but overall, the reintroduced WCT into EFSC would be only moderately secure due to a lack of an upstream source of WCT in the watershed.
Project goal 2: **Provide a secure refugia for genetically pure WCT.**	**Goal would not be met** because WCT would not be introduced into High Lake.	**Goal would be met** because genetically pure WCT would be introduced into High Lake and protected by natural and constructed barriers. High Lake has proven potential for supporting WCT without supplementation (stocking) because it previously supported an introduced population of YCT. The lake would provide a secure refugia in case of failure of the artificial fish barrier on EFSC or watershed-scale wildfire, drought and/or flood.	**Goal would not be met** because although genetically pure WCT would be reintroduced into EFSC, the population would be somewhat vulnerable to loss through a failure of the artificial fish barrier or watershed-scale wildfire, drought, and/or flood.

Alternative 1: No Action

Current management practices would continue to guide activities in the project area. No action would be taken to remove nonnative and hybridized trout populations from the EFSC watershed. Annual stream surveys of Specimen Creek and other Gallatin River tributaries would continue as funding and staff are available. These surveys would document any future loss and genetic degradation of WCT. WCT would not be reintroduced into any of their native habitat, and the long- term risk of WCT extinction within Yellowstone would remain high. No mitigation measures would be implemented.

Alternative 2: Fish Barrier, Fish Removal and Restoration of WCT in East Fork Specimen Creek and High Lake (Preferred Alternative)

The EFSC watershed encompasses approximately 84,668 acres (34,264 hectares; 44% of the entire Specimen Creek watershed) in the northwest area of the park (Figure 3). The stream length of the EFSC (creek and tributaries) is approximately 24.6 miles (39.5 kilometers), although some of these waters are in the upper reaches of tributaries above waterfalls and do not contain fish. Based on previous surveys, the total population of hybridized WCT in the EFSC is estimated to be 2,485 (approximately 311 fish per mile). Both nonnative rainbow trout and brown trout are in the stream but at densities too low for accurate population estimates.

The goal of Alternative 2 is to restore a second core WCT population within the EFSC watershed, including the creation of a secure WCT refugia in High Lake. Under this alternative, all fish- containing waters in EFSC and High Lake would be treated using piscicides, genetically pure WCT would be reintroduced into EFSC and its tributaries, and introduced into High Lake (Figure 4). High Lake and its connected spring seeps, wet meadows, and outlet stream, are isolated from the EFSC to upstream immigration of fish by a natural 15- foot waterfall located approximately 200 yards downstream from the lake outlet. This waterfall, and an artificial barrier that would be placed at the downstream end of EFSC, would be used to isolate the system for chemical treatment and protection of the established WCT population.

High Lake presently supports introduced YCT, which are not native to the upper Missouri River drainage and are a source for genetic degradation of WCT downstream. When stocked with WCT, the High Lake population would serve as an important source of WCT for the streams of this watershed through downstream drift. It would take approximately six years to fully implement this alternative (Table 2).

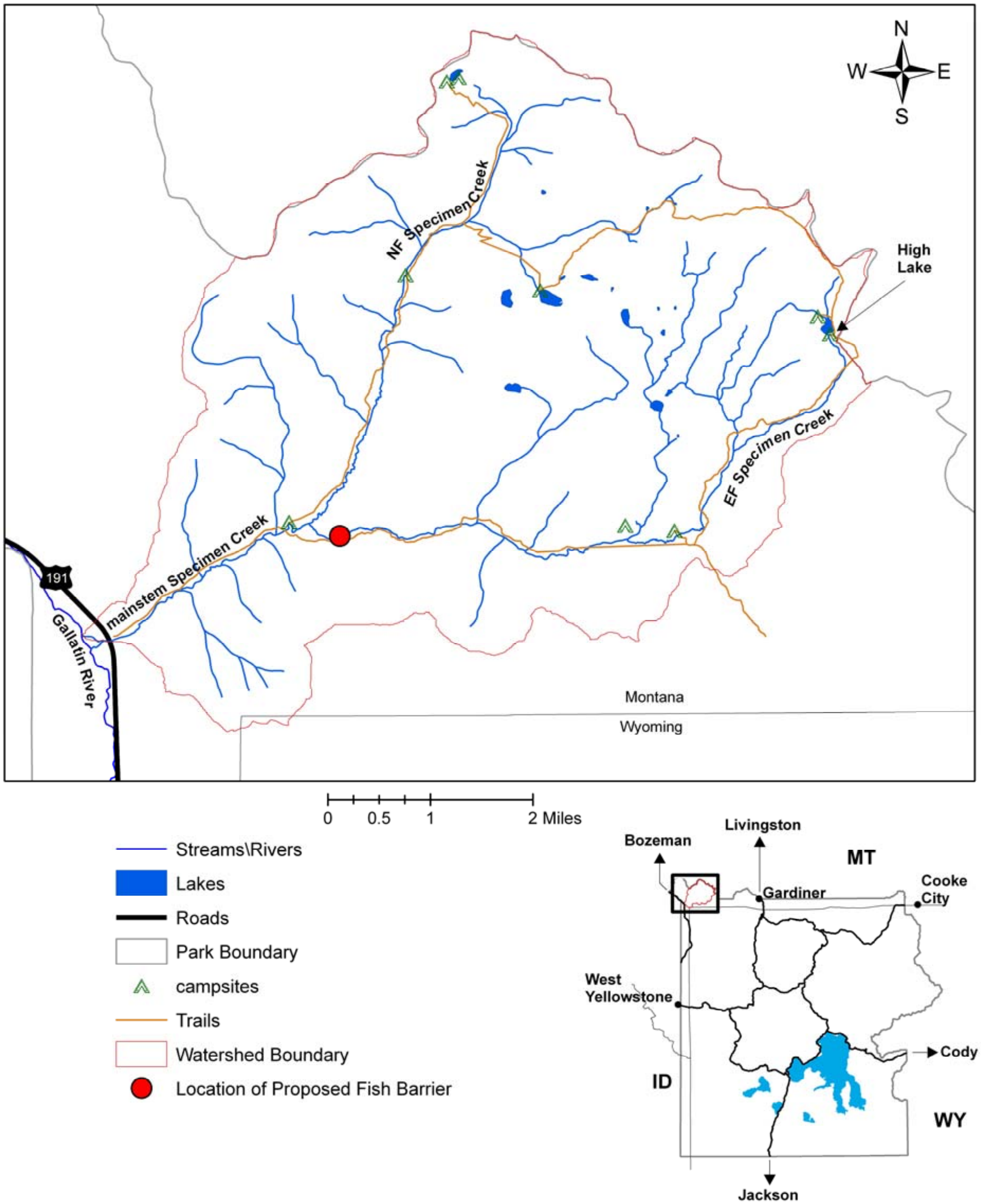


Figure 3. The East Fork (EF), North (NF) and mainstem Specimen Creek.

Table 2. Timeline for implementation of Alternative 2 (preferred alternative) in East Fork Specimen Creek (EFSC) and High Lake (HL).

	Pre-treatment survey	Bioassay w/chemicals	Barrier constructed	Chemical treatment	Post-treatment monitoring	WCT introduction	Post-introduction monitoring
2004	EFSC						
2005	EFSC, HL						
2006	EFSC, HL	EFSC, HL	EFSC	HL			
2007	EFSC			EFSC, HL	HL	HL	
2008				EFSC	EFSC, HL	HL	HL
2009					EFSC	EFSC, HL	HL
2010						EFSC	EFSC, HL
2011						EFSC	EFSC, HL
2012							EFSC, HL

Pre-treatment Surveys

Under this alternative, the EFSC watershed would continue to be surveyed to document baseline conditions prior to beginning work in each area. To date, surveys in the Specimen Creek watershed have documented fish densities, distribution, and species composition, including presence of nongame fishes (mottled sculpin, *Cottus bairdi*), aquatic invertebrate community composition, and the water quality parameters of dissolved oxygen, temperature, specific conductance, pH, and turbidity. Streamflow travel time estimates and bioassays scheduled for completion during the summer low flow period of 2006 would be used to more accurately predict the number of chemical treatment (drip) stations required to successfully complete the project. Prior to fish barrier construction, wetland specialists, hydrologists and engineers would collect detailed topographic information, including a delineation of any wetland at the site.

Surveys for sensitive native species (e.g., larval amphibians) that may be adversely impacted by the chemical treatment and WCT introduction would continue prior to treatment. Prior to chemical treatment of High Lake, EFSC and their connecting waters, surveys would be conducted for amphibian species along the stream and in the lake littoral zone. If any amphibian tadpoles are located, they may be captured and moved to other, suitable habitats away from the treatment area or transferred to holding containers onsite and monitored until they can be released into connecting waters of High Lake, if this is determined to be effective mitigation after consulting with amphibian resource specialists.

Piscicides to be Used during Chemical Treatments

Under this alternative, all fish would be removed from High Lake, its connected wet meadows and spring seeps, the flowing lake outlet, and EFSC and all of its tributaries to the uppermost extent of trout distribution. Two piscicides have been approved by the Montana Department of Agriculture and the EPA for this purpose: antimycin (Finlayson et al. 2002) and rotenone (McClay 2000; McClay 2002). Use of piscicides is the best method known to achieve a complete fish removal (and therefore cutthroat trout restoration) (Moore et al. 2005). Piscicides have been successfully used in Yellowstone for nonnative trout removal (Gresswell 1991) and for basic sampling of fishes from streams (Yellowstone National Park unpublished data 1988) as well as in other national parks.

Although rotenone and antimycin have been successful in several fish removal projects, there have been instances where they did not completely remove fish from treated waters. Unfortunately it is these instances that are rarely, if ever, reported in the literature, and a complete understanding of the failures is lacking. Antimycin was unsuccessful in completely removing nonnative brook trout from Cherry Lake, lying within the Cherry Creek watershed (tributary to the Madison River) in southwest Montana in 2003 and 2004 (Pat Clancey, MTFWP, personal communication, 2005). Pre- treatment bioassays using antimycin also failed to kill brook trout in a tributary to Soda Butte Creek (tributary to the Yellowstone River) just outside of the park and upstream of Cooke City, Montana (and upstream of the McClaren Mine tailings) in 2004 (James Olson, MTFWP, personal communication, 2004). Rotenone was used in addition to antimycin for the Cherry Lake project in 2005 and all indications are that the treatment was successful. Rotenone was used instead of antimycin for treatments on the Soda Butte Creek tributary and completely removed brook trout.

The underlying bedrock geology and resulting chemical composition of surface waters may cause variability in antimycin effectiveness in the Yellowstone region. Amphibolites and ultramafic rocks, which exist in the Cherry Creek watershed (Vuke et al. 2002), are very high in iron oxide minerals relative to other bedrock types in the region (Figure 4). The watershed of Soda Butte Creek and its upper tributaries (Miller Creek and Sheep Creek) contain andesites, breccias, diorites and associated intrusions related to the 50 million year Absaroka volcanism (Berg et al. 1999). These rocks contain minerals that have intermediate concentrations of iron oxides. The numerous metal sulfides are the main reason that people mined the area beginning in the late 1800s. Evidence of these minerals existing within surface waters can be seen along Miller Creek, where extensive deposits of precipitated iron oxide occur.

By comparison, the watershed of Arnica Creek, a tributary to the West Thumb of Yellowstone Lake that was successfully treated with antimycin to remove brook trout in 1985- 86 (Gresswell 1991), consists predominantly of rhyolitic lava flows (West Thumb and Elephant Back flows; USGS 1972). These rhyolites have high amounts of silicon dioxide and low amounts of iron and magnesium oxides, similar to those expected where water flows through quartz sand. Cold water flowing through rhyolite will generally contain low concentrations of iron and magnesium oxides (Hank Heasler, Yellowstone National Park Geologist, personal communication, 2006). The geochemistry of the Arnica Creek rhyolites is very similar to that of the bedrock of watersheds within Rocky Mountain National Park (NPS 2006), where antimycin has also been used successfully many times to remove nonnative fish (Rosenlund and Stevens 1992). Outcrops of granitic and various sedimentary rocks occur there, and are mainly composed of high silicon dioxide and a low amount of iron oxides.

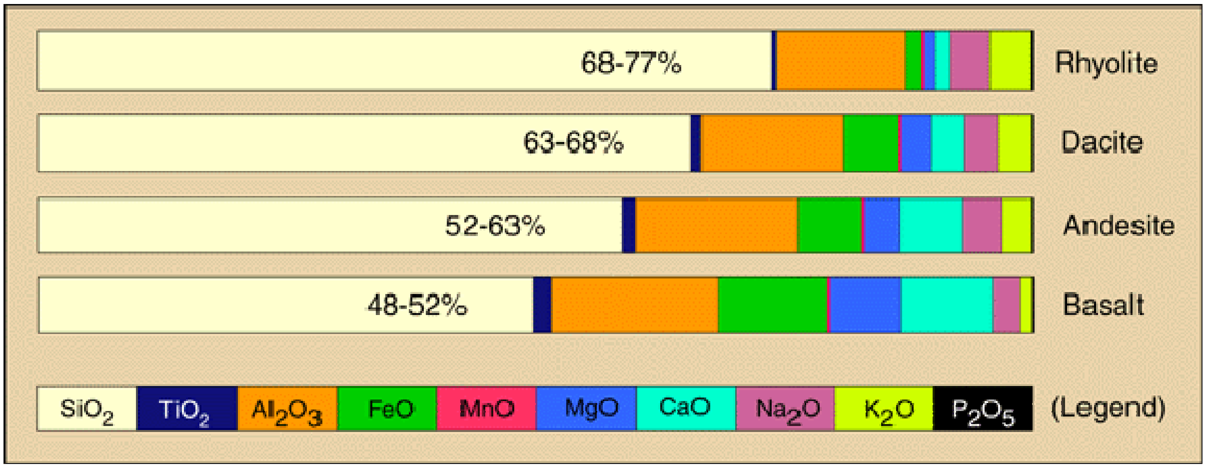


Figure 4. Average concentration of each major element for the four basic types of volcanic (igneous) rocks. Volcanic rocks are typically divided into four types according to the amount of silica (SiO_2). Other major elements in varying proportion include titanium (TiO_2), aluminum (A_2O_3), iron (FeO or Fe_2O_3), manganese (MnO), magnesium (MgO), calcium (CaO), sodium (Na_2O), potassium (K_2O, and phosphorous (P_2O_5). This bar graph shows the average concentration of each major element for the four basic types of volcanic rock. Adapted from http://volcanoes.usgs.gov/Products/Pglossary/VolRocks.html.

The geologic setting of EFSC is very similar to that of Cherry Creek and upper Soda Butte Creek, where recent uses of antimycin have failed. The bedrock geology of the EFSC watershed (including the High Lake area) consists of andesitic and basaltic lava flows of the Mount Wallace Formation (Christiansen 1974; Berg et al. 1999). Andesites have an intermediate composition of iron oxide and silicon dioxide minerals, and basalts have high amounts of iron oxide minerals (Figure 4). Although not scientifically verified, it is likely that antimycin binded with the iron oxides in these systems, reducing its ability to kill fish. Nicholas Romeo, an antimycin distributor, hypothesized that this was the case in other antimycin failures (D. Skaar, MTDEQ, personal communication, 2006). It is expected that a similar result may occur if antimycin is used in EFSC watershed and that rotenone may be more effective there.

Rotenone may be more effective than antimycin in lake environments as well because its higher specific gravity (SG) causes it to sink more readily (rotenone SG=1.3, antimycin SG= 0.8). This is especially true in lakes where a thermocline is present; the higher SG helps the chemical penetrate the thermocline and provides more thorough mixing and thus a more homogenous treatment. High Lake is known to develop a thermocline during August, which is within the proposed treatment period (Table 3; Figure 5).

Considerable study has been devoted to the persistence of rotenone (Post 1958, Engstrom- Heg and Colesante 1979, Gilderhas et al. 1988, Dawson et al. 1991, Finlayson et al 2001) but the myriad factors that likely affect it make prediction of persistence in High Lake difficult. In Wolf Creek Lake, a small (33 AF) high alpine lake in California with a comparable but lower temperature range than High Lake (Wolf Creek Lake= 5- 11°C, High Lake= 8- 16 °C) rotenone half life was calculated to be 2.9 days (Finalyson et al. 2001). Based on this result, the park predicts that rotenone would persist in the High Lake water column at detectable levels (>2 ppb) for 17.4 days post treatment. However, shorter persistence times in High Lake could occur due to the higher temperature range expected at the time of treatment. Finlayson et al (2005) also reported rotenone persistence in the sediments of Lake Davis, a large lake with a lower temperature range than High Lake, to be less than 60 days after treatment with 100 ppb active rotenone (2X the proposed treatment concentration for High Lake). The park would expect High Lake to follow a similar pattern, with no detectable rotenone in sediments after 60 days. Very little research has been published concerning the persistence of antimycin in lake waters or sediments, although it is widely considered to be less than that of rotenone. The amount of time it takes a waterbody to undergo complete water exchange may influence the persistence of piscicides in the water column. Using High Lake outlet discharge data collected in August of 2005, the calculated time required for one complete water exchange is 169 days. However, this estimate does not factor in evaporative loss.

During implementation of this alternative, studies would be conducted to better understand the effectiveness of both antimycin and rotenone in the EFSC geologic setting. Through collaboration with the USGS Montana Cooperative Fisheries Research Unit, in- stream bioassays would be used to examine the potential effectiveness of antimycin during late summer period along at least three reaches of EFSC during year 1. If deemed reasonably effective, antimycin, as recently suggested for use in national park units (Moore et al. 2005), or a combination of antimycin and rotenone, would be used for treatments of EFSC and its tributaries during years 2 and 3 (planned for 2007 and 2008). If antimycin is shown to be ineffective, rotenone would be used instead, following guidance of the product label.

Depth	Temp	pH	DO	Sp. Cond.
0.2	16.4	7.1	6.5	25
1.0	16.3	7.1	6.3	25
2.0	15.6	6.9	6.2	25
3.0	14.9	6.6	6.0	25
4.0	11.2	6.1	4.9	26
5.0	8.9	6.0	1.6	28
5.7	8.4	6.0	1.3	30

Table 3. Physiochemical depth (meters) profile taken from deepest known point (5.9 m, 19.4 ft) in High Lake on 12 August 2005 at 17:24. Parameters include temperature (Temp; °C), pH, dissolved oxygen (DO; mg/L); and specific conductivity (Sp. Cond.; μS/cm). Bathymetric data collected in 1970 estimate the lake at 55 acre feet (7.1 surface acres, mean depth 7.7 ft).

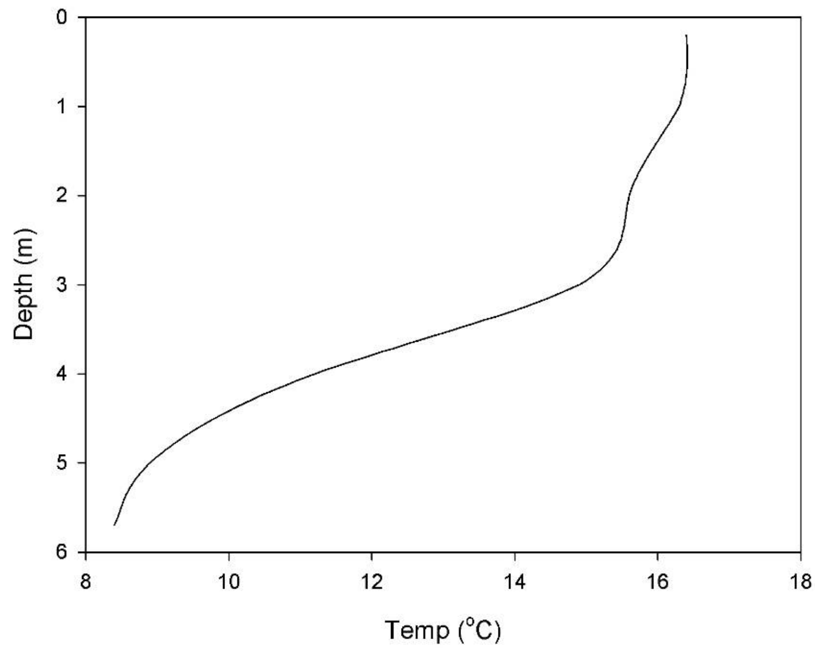


Figure 5. Temperature profile taken from deepest known point (5.9 m, 19.4 ft) in High Lake on 12 August 2005 at 17:24.

East Fork Specimen Creek Pre-Treatment Bioassays

Due to the rapid breakdown of the piscicides in the natural environment, particularly in high gradient flowing waters, bioassays must be completed prior to piscicide treatments to ensure that all fish would be removed and neither under- treatment nor over- treatment occurs. Bioassays utilize sentinel fish (hybridized WCT and/or nonnative trout from EFSC) to determine the effective downstream fish toxicity of a simulated treatment. By placing fish in cages at intervals downstream of a treatment (drip) station and treating the reach of stream at the planned piscicide concentration and duration, the effective removal distance per treatment station can be estimated (Figure 6). To estimate the amount of piscicide that would be needed for actual treatments, the bioassays would be performed in advance and scheduled to coincide with similar water conditions. Bioassays are proposed at three locations on EFSC during the first half of September in year 1 (planned for 2006) to address different environmental conditions found on EFSC. Each bioassay would take one day to complete. To ensure the active piscicide is neutralized and does not persist in surface waters, one neutralization station would be used at the downstream end of the reach for each bioassay. A 2.5% solution of potassium permanganate (KMnO4) would be added to chemically- treated waters at a concentration of 3 parts per million (ppm). Details of the neutralization process are described on pages 32 and 33.

If bioassays reveal that that the application of antimycin within the label guidelines would not be effective at removing fish from the EFSC then bioassays would be performed using liquid rotenone, using the same procedures described above. If application of rotenone within the label guidelines successfully removed fish from EFSC, rotenone would be used to complete the three planned fish removal treatments. In the unlikely event that concentrations of rotenone specified by the label for normal stream use are not effective at removing fish from the EFSC, the park would seek a Federal Insecticide, Fungicide, and Rodenticide Act section 24 C special local needs label exemption to apply the piscicide at a concentration higher than the label recommends. If a greater concentration were needed, the park would conduct a separate NEPA analysis if it determined that impacts to non- target organisms were greater than described in this EA.

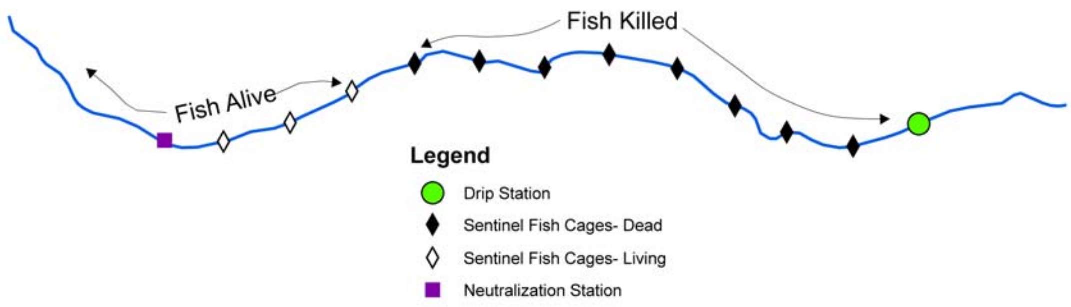


Figure 6. Generic bioassay setup. Sentinel fish cages are placed at 100 meter intervals and piscicide is applied at the planned treatment concentration and duration. The distance downstream that sentinel fish die is the effective treatment distance per drip station. In this example, the effective treatment distance is 800 meters.

High Lake Pre-Treatment Bioassays

Bioassays would be conducted for 2- 3 days prior to piscicide treatment in year 1 (planned for 2006). To determine the effective toxicity of a simulated treatment, sentinel fish will be placed in bags or buckets filled with water from High Lake and a small amount (<1 gallon) of a liquid emulsifiable formulation of rotenone (CFT Legumine, Prentiss Inc.), the product selected for the High Lake treatment, would be applied at the treatment concentration recommended by the product label.

Chemical Treatment of High Lake

During year 1 (planned for 2006; Table 2), introduced YCT would be collected from High Lake by angling or closely monitored gillnets, marked by caudal fin clip, and returned alive to the lake for purposes of examining piscicide effectiveness and for estimation of population size. To remove all YCT, High Lake (Figures 7 and 8), its inlets, connected wet meadows and spring seeps, and the flowing lake outlet downstream to the natural waterfall (approximately 200 yards downstream; Figure 9) would be chemically treated at least three times during years 1 and 2 (two treatments planned for 2006 and one for 2007). Each treatment would occur over a 14- 21 day period and would be conducted by 3- 5 certified personnel with the approved piscicide rotenone, following guidance of the product label for application and concentration 1 (ppm rotenone formulation which is 50 ppb active rotenone). The rotenone would be applied to the High Lake system (all connected waters upstream of the waterfall) during the first 2- 3 days of each treatment period. Both liquid and powder formulations of rotenone would be used. The liquid form would be mixed with water and pumped into the lake using rafts outfitted with small (<20 horsepower) outboard motors. The rafts would be moved around the lake to mix the rotenone thoroughly from surface to bottom. The liquid formulation would also be used in backpack sprayers or in- stream treatment (drip) stations. The powdered form would be used as a sand formulation (mixture of rotenone, gelatin and sand) and placed in inlets, connected wet meadows and spring seeps, and the flowing lake outlet downstream to the waterfall.

An inert, non- toxic dye tracer (Fluorescein, Rhodamine, or equivalent) would be used to improve visual tracking of the piscicide and ensure a complete coverage. If the High Lake fish are not successfully removed by the three treatments proposed under this alternative, research to determine the cause of failure would be undertaken. The work could potentially include underwater surveys for ground water inputs or other locations where fish might avoid the piscicide. Additional lake treatments would be conducted to meet project goals if the reason for initial failure can be identified and rectified. A separate NEPA analysis would be conducted if impacts were determined to be greater than those described in this EA.

The park would collect the fish carcasses that rise to the surface of High Lake and are found in connected waters, check them for clipped fins, puncture their air bladders, and then return them to the deep portion of High Lake. This would leave nutrients from the trout in High Lake and avoid attracting bears or other animals to the area. Backpacks, pack stock, and a helicopter would be used to transport rafts and outboard motors, chemicals, equipment, and camp gear to and from the High Lake area. Stock would not be kept overnight as there are no stock use campsites nearby. Helicopter flights would be used only for transport of supplies and equipment that are too heavy and/or cumbersome to be reasonably moved by backpack or pack stock and where they are determined to be the minimum tool as outlined in the MRA (Appendix B). Two to four helicopter flights are anticipated each year that chemical treatment is done.

Figure 7. Photograph of High Lake at the headwaters of East Fork Specimen Creek, which would be chemically treated to remove introduced trout.

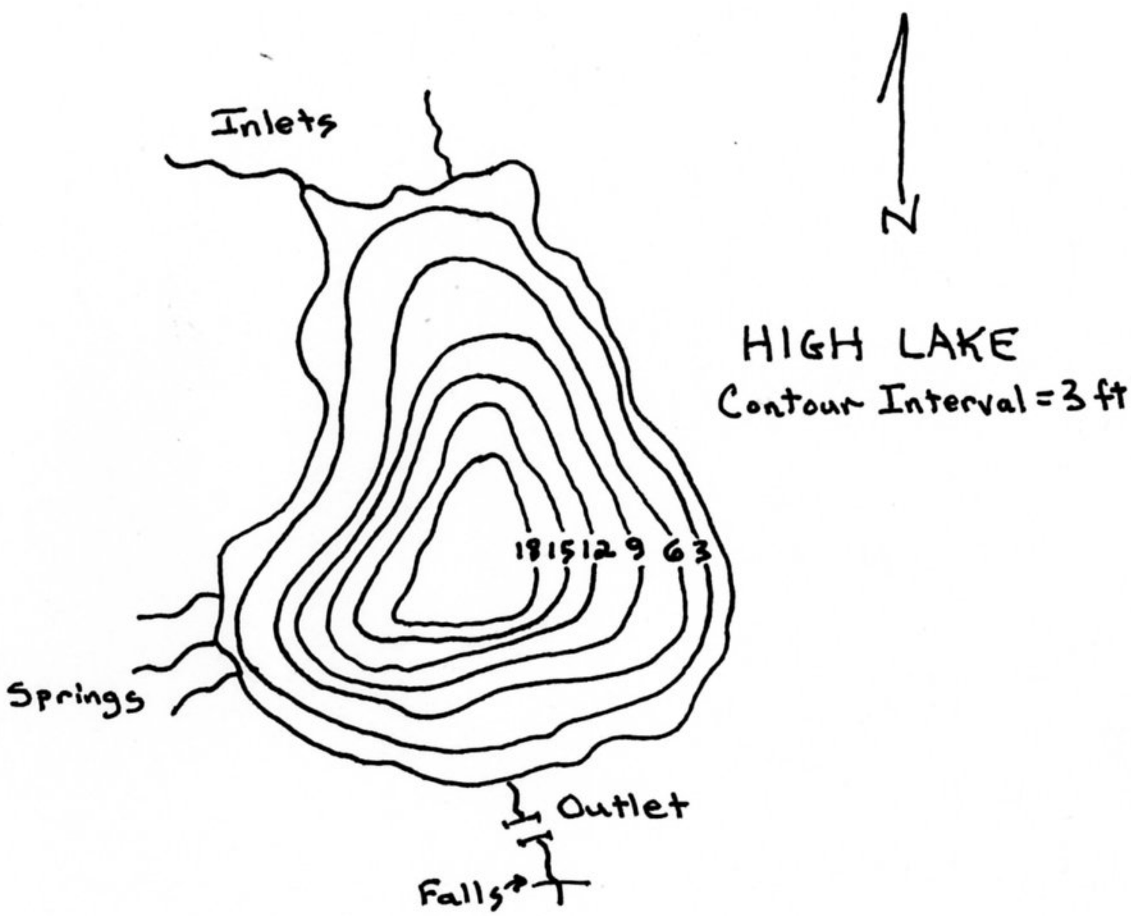


Figure 8. Bathymetry of High Lake and locations of small stream inlets, spring seeps, and the lake outlet as determined during a 1970 fisheries survey (USFWS 1971).

Figure 9. A waterfall located 200 yards downstream of the High Lake outlet isolates the lake from nonnative and hybridized trout in the East Fork Specimen Creek.

East Fork Specimen Creek Fish Barrier

A fish barrier would be constructed in the EFSC upstream 0.37 miles (592 m) of its confluence with the North Fork Specimen Creek (Figure 10) to prevent upstream movement of nonnative and hybridized trout into the restoration area. It would allow for downstream movement of WCT into the mainstem Specimen Creek. The EFSC is highly suitable for fish barrier construction because the stream reach is a high gradient area (2.7%) with a deeply incised stream channel.

The barrier would be a maximum of 6 ft (1.8 m) tall and would cover the stream bed from one bank to the other, and extend laterally into each stream bank to an extent of 2X bankfull (floodprone) width (26.9 feet; 8.2 m total; example provided in Figure 11). The barrier would extend downstream 65.6 ft (20 m) by a rock/mortar splashpad placed on the stream bottom (bankfull width of 18 ft; 5.5 m) to prevent scouring and erosion from water spilling over the barrier. The splashpad would also ensure that a jump pool does not develop below the barrier and allow fish to move upstream into the restoration area by leaping over the barrier. The riparian and in- stream area required to construct the barrier would be 26.9 ft (8.2 m; floodprone width) multiplied by 3.3 ft (1 m; barrier thickness) = 88 ft^2 (8.2 m^2), and 18 ft (5.5 m; within bank width) multiplied by 65.6 ft (20 m; splashpad length) = 1,184 ft^2 (110 m^2). The total area potentially required would be 88 ft^2 plus 1,184 ft^2 = 1,272 ft^2 (118.2 m^2;0.029 acre). These calculations are averages based on measurements taken during previous surveys at several points along the downstream reach of the EFSC.

Construction would take advantage of naturally occurring boulders to form part of the barrier, which would be anchored into the streambank to ensure persistence (Figure 11). Some excavation along the streambank would be necessary to anchor the barrier and ensure no openings remain through which fish could move upstream. Approximately 19.3 cubic yards (14.8 m^3) of mostly natural material would be needed to construct the barrier, including native trees and rock obtained near the site. If sufficient dead and down material cannot be located nearby, up to fifteen live large diameter (24 inches dbh) conifers may be cut. Unnatural materials such as rebar, wire mesh, steel, and mortar (cement mixed with sand) would also be used to tie the structure together and anchor it into the streambank. The barrier may also contain gabions (metal cages) filled with available rocks and boulders found on site. These porous structures would allow some water to flow through the structure without allowing the passage of fish upstream.

Equipment and supplies would be transported by backpack and pack stock starting at the Specimen Creek trailhead, and carried on foot the final few hundred feet to the barrier construction site along the creek. The work crew (6- 8 total) would stay at the backcountry campsite (WE 1) at the confluence of the East Fork and North Fork Specimen Creek. The project would take approximately 16 work days in September/early October to complete. The barrier would be built and placed using hand tools (e.g., axes, shovels, and hand saws). The only anticipated use of motorized equipment would be a chainsaw to cut large diameter logs.

To greatly reduce the potential for sediment inputs to the EFSC, large, flexible pipes would divert water from the stream channel immediately above and around the barrier construction site. The pipes would allow water to re- enter the stream channel immediately below the site. An NPS fisheries biologist would be on site during barrier construction to watch for any excessive sediment inputs to the stream channel. If excessive inputs are noted, construction would halt until the cause is determined and rectified.

Figure 10. Stream reach where fish barrier would be placed on East Fork Specimen Creek.

Figure 11. Fish barrier constructed primarily of natural materials. (Photo courtesy of Mark Buktenica, Crater Lake National Park.)

Testing the Fish Barrier

Following completion of the fish barrier during September/early October of year 1 (planned for 2006), and at least once during each of years 2 and 3, the park would use backpack electrofishers to collect fish from EFSC immediately below the barrier and downstream to the confluence of the North Fork Specimen Creek (Figure 3). All collected fish would be clearly marked by fin clips and/or tags. Project biologists would then search for these marked/tagged fish during years 2 and 3 (planned for 2007 and 2008), as all fish are removed from EFSC and its tributaries above the barrier using piscicides. Barrier effectiveness for preventing upstream movement of fish would be confirmed by a lack of any marked or tagged fish found during chemical treatments upstream of the barrier. If one or more tagged fish are found upstream of the barrier, the barrier design would be re- evaluated by seeking advice from collaborating USFS hydrologists and engineers, with a minimum of disturbance to the area. The modified barrier would be retested using the same protocols for at least two years prior to the stocking of any WCT to EFSC. Each year following snowmelt runoff, project biologists would inspect the fish barrier for structural integrity and the potential for any damage. The barrier would be maintained to ensure persistence and protection of introduced WCT in EFSC.

Chemical Treatment of East Fork Specimen Creek

To remove all nonnative and hybridized trout, the EFSC, its tributaries (at least 5) and connected wet meadows and spring seeps known or suspected to contain fish, would be chemically treated using the EPA approved piscicides, antimycin and/or rotenone, for a total of three times over two years (two planned for 2007 and one for 2008). Each treatment would occur over a 14- 21 day period and would be conducted under the supervision of 3- 5 certified personnel, following product label guidance for application and concentration. The treatment periods would occur during August and early September, after stream flows have declined to seasonal lows, and before the daily average water temperatures decline below 5°C, which is considered the lower limit of effectiveness for antimycin and rotenone (Figure 12).

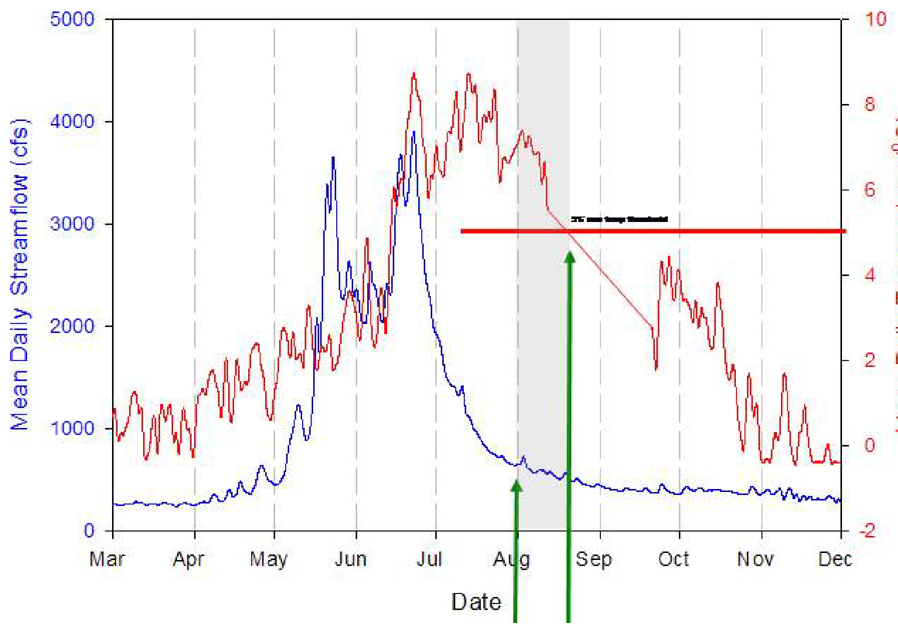


Figure 12. Annual streamflow (Gallatin River gage 06043500), and daily stream temperature (East Fork Specimen Creek) with optimal period for chemical treatment indicated between arrows. Antimycin generally becomes ineffective at stream temperatures below 5°C.

A liquid formulation of antimycin, or rotenone if antimycin proves ineffective (see Bioassays above), would be applied at a concentration of 10 ppb active antimycin (50 ppb active rotenone) for eight hours at each of several treatment stations placed sequentially upstream to downstream (Figure 13). Treatment stations would consist of a reservoir and a metering device designed to apply the piscicides at a predetermined rate (Figure 14). Upon completion of treatment for a given stream reach and series of simultaneously operated stations, the stations would be moved as a group in leap- frog fashion downstream over a period of several days until the fish barrier is reached. The number of treatment stations and distance between them would be determined immediately pre- treatment as they are dependent on stream flows, temperature regimes, sunlight intensity, and vertical elevation loss. Treatment stations would be operated during daylight hours and only with close, continuous observation by trained personnel. Nets extending across the stream (right bank to left bank) would be used at night and during any breaks during treatment to prevent upstream movement of unwanted fish into restoration areas.

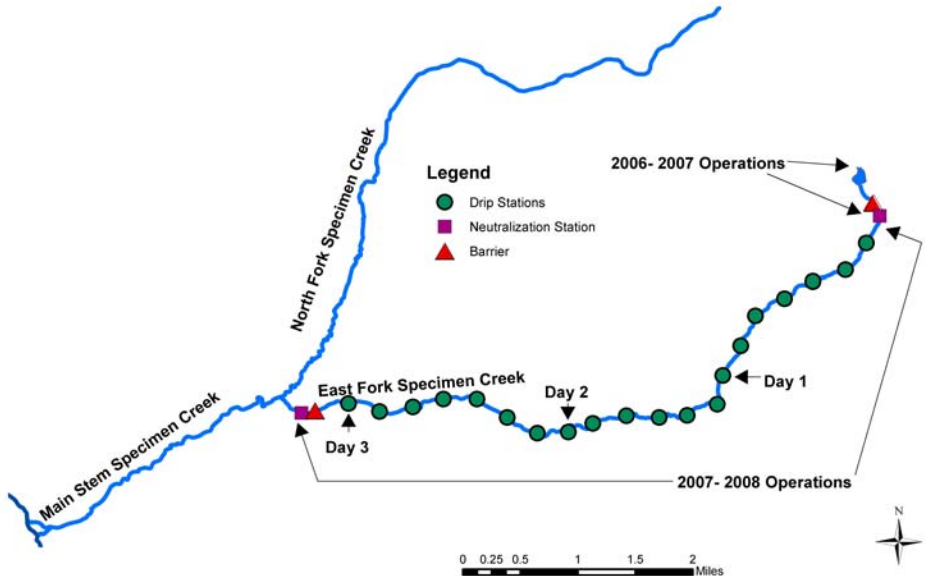


Figure 13. Locations of fish barrier, chemical treatment (drip) stations, and potassium permanganate ($KMnO_4$) neutralization stations to be used for fish removal operations over a two-year period in High Lake and connecting waters (planned for 2006 and 2007) and a two-year period in East Fork Specimen Creek and connecting waters (planned for 2007 and 2008) assuming 500 meters between in-stream treatment stations. Actual distance between and number of treatment stations, and total days required to complete the treatments would depend on ambient stream conditions when removal occurs during late summer. At least five tributaries, spring seeps, wet meadows, and other connecting waters that are not shown would also require chemical treatment and affect the time required to complete the treatments.

Figure 14. In-stream antimycin treatment (drip) station. Photo courtesy of Steve Moore, Great Smoky Mountains National Park.)

Liquid antimycin and/or rotenone would be applied using backpack sprayers, and rotenone as a powder- sand formulation (mixture of rotenone, gelatin and sand) at a concentration of 1 ppm rotenone formulation (50 ppb active rotenone) to EFSC connected wet meadows, spring seeps, and in- stream habitats not affected by the antimycin treatment stations. An inert, non- toxic dye tracer (Fluorescein, Rhodamine, or equivalent) would be used in backpack sprayers, with sand formulation, and/or at each treatment station to improve visual tracking of the piscicides.

If the EFSC fish are not successfully removed by the three treatments proposed under this alternative, research to determine the cause of failure would be undertaken. Additional stream treatments would be conducted to meet project goals if the reason for initial failure can be identified and rectified. A separate NEPA analysis would be conducted if impacts were determined to be greater than those described in this EA.

The trout carcasses found in EFSC and connected waters would be immediately collected, transported out of the watershed using pack stock, and brought to a local landfill. Backpacks and pack stock would be used to transport treatment stations, chemicals, equipment, and camp gear to and from the EFSC area.

Neutralization of Rotenone and Antimycin Treatments

To ensure the active piscicide is neutralized and does not persist in surface waters, a 2.5% $KMnO_4$ solution would be added to chemically- treated waters at a concentration of 3 ppm. In the EFSC, one $KMnO_4$ neutralization station (Figure 15) would be placed below the fish barrier at the downstream end of the treatment area. Operation would begin concurrently with the chemical treatment and end after sufficient time has passed to allow the piscicide from the treatment station furthest upstream to reach the neutralization station. This would vary by day and among sites depending on ambient flow (discharge) and other factors.

Rotenone applied to lakes does not oxidize as readily as in stream environments, and consequently would remain active in the lake and outlet stream for a longer time. For the High Lake treatment, a neutralization station would be placed downstream of the outlet and below the waterfall. The $KMnO_4$ application would begin concurrently with rotenone application to the lake and connecting waters and would continue 24 hours per day for 14 days.

Figure 15. In-stream potassium permanganate ($KMnO_4$) piscicide neutralization station. (Photo courtesy of Steve Moore, Great Smoky Mountains National Park.)

The $KMnO_4$ solution for the neutralization stations would be produced on site by mixing $KMnO_4$ crystals into stream water (10 lbs of $KMnO_4$ in 50 gallons of water) in large reservoirs. The $KMnO_4$ application rate would be determined each day using ambient flow data and with the $KMnO_4$ addition to treated water metered to meet the 3 ppm guideline and allow precise adjustment as necessary. Thirty minutes of contact time is required to completely detoxify piscicides, meaning that the area affected by piscicide treatment includes the distance downstream of the $KMnO_4$ station that can be traveled by treated water over a period of 30 minutes. The effectiveness of the piscicide neutralization would be determined by observing survival of sentinel fish in cages at a location downstream corresponding to the distance traveled during 30 minutes of $KMnO_4$ contact time (Figure 16). The concentration of $KMnO_4$ may be increased if complete neutralization is not achieved after 30 minutes of contact time. Successful neutralization of antimycin and rotenone by $KMnO_4$ is accomplished by carefully balancing the amount of $KMnO_4$ with the natural chemical demand of the water and the chemical demand caused by antimycin or rotenone.

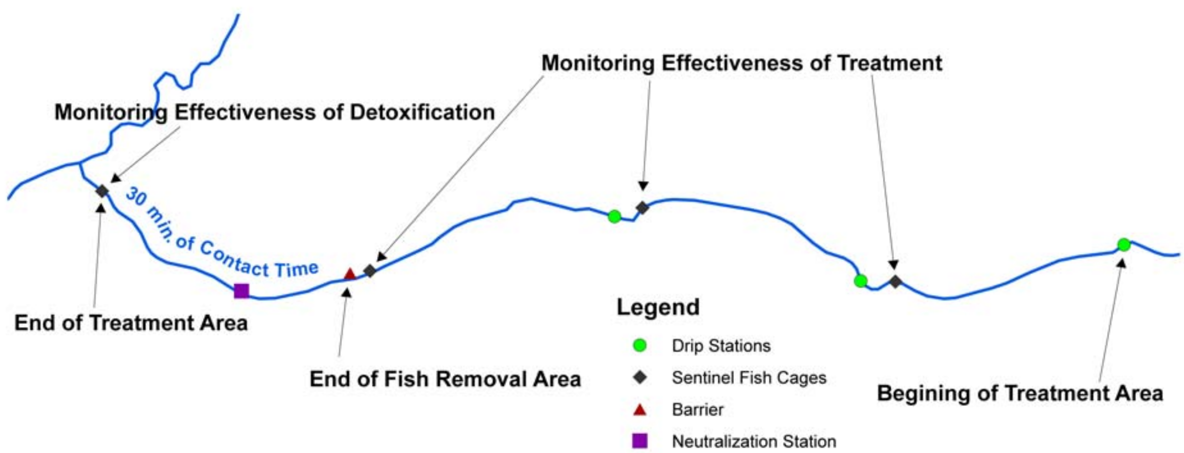


Figure 16. Chemical treatment model proposed for East Fork Specimen Creek showing spatial relationships among chemical treatment (drip) stations, sentinel fish cages, and the $KMnO_4$ neutralization station. Sentinel fish are used to monitor the effectiveness of the chemical treatment and the neutralization process (30 minutes downstream of the $KMnO_4$ station and at the lower end of the treatment area).

Restoration of WCT in High Lake and East Fork Specimen Creek

High Lake represents an invaluable opportunity to develop a secure, self- sustaining WCT population within a system that has proven to adequately support introduced YCT for over 70 years. The EFSC and the downstream reaches of its tributaries represent more than 12 miles of connected habitat for genetically pure WCT (Figure 17). The WCT to be introduced to High Lake and EFSC would be from one or more potential sources:

- An unnamed Grayling Creek tributary (preferred)
- Sun Ranch WCT brood stock
- North Fork Fan Creek (if genetically pure WCT are verified there in the future) and/or
- the WCT brood stock held at Washoe Park State Trout Hatchery, Anaconda, Montana.

As headwater fluvial specialists, the WCT within the unnamed Grayling Creek tributary and the North Fork Fan Creek should be well- suited to persist in EFSC and its tributaries. The WCT from the Sun Ranch brood stock, which are considered generalists, were founded from the few donor populations remaining in the upper Madison/Gallatin drainages. The WCT from the Washoe Park State Trout Hatchery, also considered generalists, were founded from several streams in the South Fork Flathead and Clarks Fork River drainages. The Sun Ranch and Washoe Park WCT likely possess the genetic heterogeneity necessary for an introduced population to remain viable in High Lake and its connecting waters. It is likely that, if available, WCT from more than one source would be used in both the EFSC streams and High Lake. It is not known if WCT restoration success would be influenced by the source of WCT used (nearest neighbor stream or lake vs. hatchery brood stock).

Figure 17. The proposed action would result in the reintroduction of genetically pure westslope cutthroat trout to the East Fork Specimen Creek and introduction into High Lake.

The source WCT would be transported to High Lake and EFSC primarily by use of pack stock and/or backpack in oxygenated, iced coolers. If it becomes imperative to move quickly to reduce stress on the fish, it may be necessary to use a helicopter for WCT transport to the upper reaches of the watershed. It is anticipated that one or two helicopter flights and landings would be used annually for transport during years when WCT would be reintroduced to EFSC or introduced to High Lake.

The WCT would be introduced either as fertilized (eyed) eggs held within streamside incubators as age- 0 fry, juveniles and/or adults, depending on availability and logistical constraints. The streamside incubators would be distributed at sites throughout the EFSC at a frequency of approximately one every 0.25 mile. The WCT fry would be introduced at a density of approximately 5 fry per square meter of stream, which is within the suggested range for stocking WCT habitats (Shepard 1983).

Reintroduction of Mottled Sculpin

During the same years that WCT are introduced to EFSC upstream of the fish barrier, mottled sculpin, a nongame species native to lower reaches of the Specimen Creek drainage, would be reintroduced at densities sufficient to ensure that a viable, reproducing population would persist. The mottled sculpins to be reintroduced to EFSC would be juveniles and adults collected by electrofishing from the mainstem Specimen Creek and North Fork Specimen Creek, where the species exists in high abundance. Movement would be by pack stock and/or backpacks in oxygenated, iced coolers.

Recreation Opportunities During Implementation

Trails and most campsites within the EFSC watershed would remain open to visitors during project implementation. Label requirements for both antimycin and rotenone restrict public entry into the project area so trails and campsites near waters with active piscicide would be closed or have limited access during treatments. Most campsites would not be affected; however, several would be needed for use by project personnel to complete the project.

Mitigation Measures

To inform visitors of WCT restoration activities in the watershed, signs would be placed in clearly visible locations at the Specimen Creek trailhead, all locations in the upper watershed where trails enter from adjacent watersheds, and at all campsites and major trail junctions within the watershed. The signs would describe the project, provide water consumption advisories, and specify where potable water is available in the area. Information would be available in park visitor centers and Ranger/Interpretive staff would be informed to answer questions from visitors. A park resource specialist would remain in the watershed when piscicide application is in progress to respond to visitor questions.

The park would transport potable water to High Lake and EFSC for use during piscicide application periods. Commercial outfitters and non- commercial visitors/anglers would be redirected during trail restricted times (during piscicide applications) to other nearby trails and campsites by Yellowstone's Backcountry Office to mitigate impacts to outfitters and visitors.

All project personnel would wear safety equipment and be trained on the safe handling and application of the piscicides and $KMnO_4$. Safety equipment includes eye and skin protection and a respirator. Chemicals would be transported, handled, applied and stored according to the label specifications to reduce the possibility of human exposure or spill. The attached Safety and Health Plan (Appendix A) includes procedures to follow in case of an accidental spill and the required safety equipment to be used by project personnel.

To greatly reduce the potential for sediment inputs to the EFSC, large, flexible pipes would divert water from the stream channel immediately above and around the barrier construction site. The pipes would allow water to re- enter the stream channel immediately below the site. An NPS fisheries biologist would be on site during barrier construction to watch for any excessive sediment inputs to the stream channel. If excessive inputs are noted, construction would halt until the cause is determined and rectified. The park will monitor for impacts to water quality throughout the project to compare to pre- treatment survey data to ensure that water quality standards are not exceeded.

The park would collect the fish carcasses that rise to the surface of High Lake and are found in connected waters, check them for clipped fins, puncture their air bladders, and then return them to the deep portion of High Lake. This would leave nutrients from the trout in High Lake and avoid attracting bears or other animals to the area. After piscicide treatments in the EFSC, fish carcasses would be collected and transported out of the watershed as soon as possible to avoid attracting wildlife (including the federally threatened grizzly bear, gray wolf, and Canada lynx) to the EFSC and thereby reduce the likelihood of wildlife- human conflicts.

The park will conduct a survey of breeding amphibians in High Lake, its inlets, connected spring seeps and wet meadows, and the outlet downstream to the waterfall from Jun 15- July 31 of year 1 (planned for 2006). To mitigate impacts to amphibians, any amphibians that are found in waters to be chemically treated would either be removed to nearby standing waters that would not be chemically treated, or held in containers away from the treatment area until waters are judged safe for their return, if either of these methods is determined appropriate. Hygiene protocols to prevent disease in frogs would be used if amphibians are moved by park personnel (Berger et al. 2004).

The park has completed a wilderness Minimum Requirement Analysis (MRA, Appendix B) for equipment that would be used to implement the project. Any resource impacts to vegetation and soils would be rehabilitated under the guidance of NPS resource advisors.

Monitoring

Monitoring to determine effectiveness of the chemical treatment to remove nonnative and hybridized trout would be conducted by the use of sentinel fish held in cages within the treatment areas. Effectiveness would also be judged post- treatment by conducting visual surveys for fish, electroshocking of complex habitats (boulders, undercut banks, and/or abundant large woody debris), and by the use of multi- mesh gillnets set in High Lake from October to June following the first treatment year.

Monitoring for any potential impacts of piscicides and/or $KMnO_4$ on aquatic invertebrate communities and amphibian species would be conducted immediately following treatment and for several years thereafter. Impacts would be judged by comparing post- treatment data to that collected during pre- treatment surveys at sites throughout the EFSC (both treated and un-treated streams) and in High Lake.

Monitoring of impacts to water quality would occur by obtaining samples prior to chemical treatment, concurrent with treatment, and post- treatment, both within and downstream of the treatment areas. Analyses would be conducted to detect volatile organic compounds, semi-volatile organic compounds, and rotenone. Antimycin, at concentrations used to remove fish, cannot be detected in water analytically and would not be monitored for; however, the solvents used to disperse antimycin in water (acetone, diethyl- phthalate, and nonoxynol- 9) would be monitored as a portion of the volatile organic compounds and semi- volatile organic compounds.

Monitoring restored trout (and mottled sculpin) would continue for several years to determine population viability and associated characteristics, such as spatial distribution and habitat use, tendency to remain within the restoration area (above the fish barrier), success of natural reproduction, population size structure, densities of fish, absence of nonnative species, maintenance of genetic purity, individual growth rates and longevity.

Although angling on High Lake and EFSC would be temporarily closed during treatment to ensure visitor safety and post- treatment to allow WCT to repopulate the watershed, the ultimate goal of the proposed project is to create a productive and unique native fishery. Very few opportunities to fish for genetically pure WCT remain in southwest Montana. Monitoring of the success of this fishery would in part be conducted through the long- term Volunteer Angler Report Card program, which has been in place in Yellowstone for more than three decades. The park will provide information on pre- treatment surveys, monitoring and project operations in its *Yellowstone Fisheries & Aquatic Sciences* annual report.

Factors that Could Potentially Delay Successful WCT Reintroduction

The timeline presented for implementation of this alternative (Table 2) assumes optimal environmental conditions for the chemical treatments and no unexpected logistical constraints. Within a given year, the work elements expected to be completed should allow for some flexibility for dealing with extreme weather and any resulting declines in water temperature or increases in stream flows. However, if conditions result in only a partial removal of targeted fish, or if there is a failure for some reason in the in- stream fish barrier, it may be necessary to extend the project for additional years to ensure project goals are met. A separate NEPA analysis would be conducted if impacts were determined greater than described in this EA.

Permitting

All required local, state, and federal permits required for the actions proposed under this alternative would be obtained prior to initiation of each applicable work element (Table 4).

Table 4. Anticipated permits required to implement the proposed project.

Name of Permits/Authorizations	Agency
Montana Stream Protection Act 124 permit	Montana Department of Fish, Wildlife, and Parks (MFWP)
318 Authorization (Short-term Exemption From Water Quality Standard for Turbidity, Montana Water Quality Act)	Montana Department of Environment Quality (MTDEQ)
308 Authorization (Short-Term Exemption From Surface Water Quality Standards for Emergency Remediation/Pesticide Application, Montana Water Quality Act, submitted for each year of application)	MTDEQ
Clean Water Act Section 404 General Regional Permit	U.S. Army Corps of Engineers
Montana Wild Fish Transfer Form (required to move fish from one Montana water to another)	MFWP

Alternative 3: Fish Barrier, Fish Removal and Reintroduction of WCT in East Fork Specimen Creek Only

This alternative is similar to Alternative 2 except that WCT would not be introduced into High Lake, a naturally fishless headwater lake within the EFSC watershed. Nonnative and hybridized WCT would be removed through chemical treatment from EFSC, its tributaries, and High Lake as described for Alternative 2. A waterfall 200 yards downstream from High Lake, and construction of a fish barrier at the downstream end of EFSC would serve to isolate the system from nonnative and hybridized fish. Genetically pure WCT would be introduced to the EFSC; however, WCT would not be introduced to High Lake and it would remain a fishless lake. No other efforts to restore High Lake would be undertaken as part of this alternative. Mitigation measures implemented for Alternative 3 would be the same as under Alternative 2.

This alternative could provide a unique research opportunity for documenting the response of organisms to a fish removal from a subalpine lake in the future. It would also meet NPS mandates to conserve indigenous and terrestrial fauna (NPS 2001). The desire to create additional recreational opportunities in the backcountry led managers to wide- spread stocking of originally fishless, alpine/subalpine lakes in the late 1800s and early 1900s. By 1992, 59% (9,500) of 16,000 historically fishless lakes in the western U.S. had been stocked with fish (Bahls

1992). High Lake was stocked with nonnative YCT in 1937. Following chemical treatment and removal of YCT, High Lake and connecting waters upstream of the waterfall would not be restocked with WCT. The invertebrate community of High Lake prior to fish stocking in 1937 was likely much different than is present today. In similar alpine/subalpine lakes of the western U.S., large- bodied macroinvertebrates and zooplankton species were greatly reduced by introduction of fish (Anderson 1972, Knapp et al. 2001). Literature suggests that if the lake were maintained in a fishless condition, the invertebrate community would recover more quickly following fish removal (Knapp et al. 2005). Amphibians that inhabit High Lake are likely to become more abundant if fish are not restored to this lake.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA, 42 U.S.C.A. § 4321 et seq., Public Law 91-190 (1970)), which is guided by the CEQ. The CEQ provides direction that "[the] environmentally preferable [alternative] is the alternative that would promote the national environmental policy as expressed in NEPA's Section 101 (40 CFR §1500 et seq.):

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
(2) Ensure for all Americans safe, healthful, productive, and aesthetically 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 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 would permit high standards of living and a wide sharing of life's amenities.
(6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Under Alternative 1 (No Action), genetically pure WCT would not be restored to the ESFC watershed. The genetic integrity of WCT would likely continue to degrade over time; no measures would be taken to conserve this species. Alternative 1 would partially meet criteria 2 and 3 in that there would be no short- term resource degradation or risk to project personnel health and safety from the use of piscicides. It would not meet criteria 1, 4, 5 and 6 because the park would not implement measures to conserve a native species in the park that is at risk of extinction.

Alternative 2 (Preferred Alternative) would restore genetically pure WCT into the EFSC watershed by reintroducing them into the EFSC and creating a secure refugia by introducing them into High Lake. Alternative 2 would meet criteria 1, 4, 5, and 6 because it would reverse the decline of the genetic integrity of a native fish species in the park that is at risk of extinction. Alternative 2 would not fully meet criteria 2 and 3 because it would 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 a long- term, minor to moderate adverse impact to wilderness through a permanent in- stream fish barrier. However, it would partially meet criteria 2 in that it would result in the restoration of a genetically pure population of WCT that would lead to a more productive environment.

Alternative 3 is the NPS Environmentally Preferred Alternative because it would best meet the six criteria. Alternative 3 would meet criteria 1, 4, 5, and 6 because it would moderately reverse the decline of the genetic integrity of a native fish species in the park that is at risk of extinction. Although this alternative would not fully meet criteria 2 and 3 because it would result in a short-term degradation of natural resources, pose a short- term risk to health and safety, and result in a long- term, minor to moderate adverse impact to wilderness through a permanent in- stream fish barrier, it would meet criteria 3 better than Alternative 2. Under Alternative 3, genetically pure WCT would be reintroduced into EFSC but not introduced into High Lake, returning High Lake to its historically fishless condition. The historically fishless aquatic community would restore on its own.

Alternatives Considered But Dismissed From Further Analysis

1. Multiple electrofishing passes with or without piscicide treatment(s).

Electrofishing is a fish capture technique that uses electric current to immobilize fish to obtain ecological data or remove unwanted fish. However, this method tends to select for larger sized fish. Small, young- of- year and juvenile fish, particularly within complex habitats, may be able to avoid the electric field and remain in the stream. Not removing all of the targeted nonnative and hybridized trout would result in a project failure, because they could hybridize and/or compete with the restored WCT in the EFSC watershed. Because electrofishing would not result in complete removal of fish from EFSC, it is highly probable that an equal number of piscicide treatments would also be required. This alternative was dismissed because electrofishing alone would not result in complete removal of the targeted fish, and when used in combination with piscicide treatment(s), would significantly reduce overall project efficiency, and therefore increase the length of time before genetically pure WCT could be restored.

2. Combination of removal by anglers and stocking of genetically pure WCT.

This alternative would temporarily suspend all protective angling regulations in High Lake, EFSC and its tributaries. Anglers would be encouraged to harvest fish in June and July prior to piscicide treatments. There would be potential for resource damage by high visitor use of this pristine area. Angling would not result in complete fish removal because large numbers of hybridized and nonnative fish, particularly larval and juvenile fish, would likely be missed. Stocking of genetically pure WCT to increase the genetic purity ("genetic swamping") would not result in the restoration of a genetically pure population of WCT because: 1) only YCT currently exist in High Lake and there is no practical way of genetically swamping the system with WCT to obtain a genetically pure WCT population, and 2) a source for genetically pure WCT that would produce gametes and/or fry in sufficient abundance for successful genetic swamping of the EFSC system does not exist east of the Continental Divide. This alternative was dismissed because without a complete removal of nonnative and hybridized fish, the project goal to restore a genetically pure WCT population would not be met.

3. Piscicide treatment and stocking of WCT into North Fork Specimen Creek and its tributaries, and use of a permanent fish barrier on mainstem Specimen Creek.

During fall 2005 public scoping, the park proposed removing nonnative and hybridized trout from the North Fork Specimen Creek as well as the EFSC, construction of more than one temporary barriers on EFSC, and construction of a permanent barrier on the mainstem Specimen Creek. However, subsequent analysis indicated that a permanent barrier on the mainstem Specimen Creek would require a much larger structure with potentially greater resource impacts than anticipated for the proposed project. Although the North Fork and mainstem Specimen Creek would contribute to the metapopulation structure of genetically pure WCT restored to the Specimen Creek watershed, these areas are not critical for a successful restoration of a genetically pure WCT population in the EFSC watershed. The East Fork contributes nearly twice the streamflow and approximately twice as many trout as the North Fork. In addition, High Lake in the EFSC watershed is the only lake in the Specimen Creek watershed that was stocked with YCT in 1937 that has continued to support YCT without additional stocking. Therefore, the park dismissed this alternative from further analysis for this EA.

After genetically pure WCT has been successfully restored to the EFSC watershed, the park may construct a permanent barrier on the mainstem Specimen Creek and reintroduce WCT into the North Fork and mainstem Specimen Creek if the park determines it is feasible and would enhance the WCT population. This would require a separate NEPA environmental analysis.

AFFECTED ENVIRONMENT

Health and Human Safety

Visitation to Yellowstone has averaged 2.8- 3 million visitors each year; most visitation occurs during the summer months. Visitor use in the park is concentrated in the major developed areas, such as Old Faithful, Canyon, Lake, and Mammoth Hot Springs. Backcountry use accounts for 5- 10% of park visitation (NPS 2000).

Backcountry use in the Specimen Creek watershed, which includes anglers, outfitters, and hikers, is relatively low. Backcountry outfitters bring 10 overnight trips into the Specimen Creek drainage during August and September each year, with 8- 10 visitors on each trip (total of 80- 100 visitors). From 2003- 2005, an average of 20- 31 visitors a year came into the Specimen Creek watershed on commercial day use trips with stock. No data are available that summarize the number of anglers, hikers, and wildlife watchers on non- commercial day use trips in this watershed. Specimen Creek, its tributaries, and high mountain lakes are used by visitors and stock as an important source of drinking water, particularly near campsites and trail crossings.

The EFSC fish barrier (Figure 3) would be the furthest downstream that piscicides would be present during treatments. Water from the Gallatin River for stock and domestic use (human consumption) begins 12- 14 miles downstream from the EFSC fish barrier (S. Compton, Montana Department of Natural Resources and Conservation, personal communication, 2006).

Approximately 10- 20 project personnel would be present in the project area for the piscicide treatments, construction of fish barrier, WCT stocking, and transport of equipment and materials by stock, on foot and by helicopter.

Water Quality

NPS policies require protection of water quality consistent with the Clean Water Act and NPS Director's Order 77- 8. Specimen Creek is a tributary of the Gallatin River, which under Montana statute is an Outstanding Resource Water within Yellowstone (Mont. Code Ann. 75- 5- 103 (20)(a)). Specimen Creek exhibits geophysical, hydrological, and chemical characteristics common to high elevation, cold water systems of the northern Rocky Mountains. The drainage is generally covered by snow during the first part of the year. Snowmelt, which usually begins in

May, contributes to low water temperatures and high stream flow during May and June. These high flow conditions ultimately lead to higher turbidity and lower conductivity values. During July and August, water temperatures and specific conductivity values generally increase while turbidity values decrease. Substrate within Specimen Creek is primarily composed of cobble and coarse gravel, which is ideal for aquatic invertebrates and larval fishes.

Water quality parameters were sampled at stream locations during 2004 and 2005 and at High Lake in 2005. These water quality parameters include temperature, dissolved oxygen (DO), pH, specific conductivity, and turbidity. Both water temperature and DO were within ranges expected for high elevation, cold water streams during August (Table 5). Factors influencing the relatively wide range in water temperature include time of day sampled, air temperature, canopy cover, and elevation changes. Since DO is temperature dependent, differences in DO concentrations are most likely attributable to changes in water temperature. Values for pH remained relatively neutral to slightly basic with a range between 7.4 and 8.2 standard units for all sites combined. Both specific conductivity and turbidity values were relatively low, with ranges between 23 and 49 micromhos/cm ($\mu S/cm^{-1}$) and between 0.4 and 1.9 nephlometric turbidity units (NTU) respectively.

Table 5. Range of water quality parameters within the mainstem (MS), North Fork (NF), and East Fork (EF) Specimen Creek and High Lake, August 2004 and 2005.

Location/Year Sampled		**Water temperature (°C)**	**Dissolved oxygen (mg/L)**	**pH (SU)**	**Specific conductivity ($\mu S/cm^{-1}$)**	**Turbidity (NTU)**
MS, NF, EF Specimen Creek / 2004	High	9.3	10.7	8.2	49	1.9
	Low	4.3	8.1	7.4	25	0.4
EF Specimen Creek / 2005	High	12.8	10.3	8.2	49	1.6
	Low	4.7	7.4	7.6	23	0.4
High Lake / 2005	Surface	16.5	6.8	6.6	25	0.6-0.8
	Bottom	8.3	0.7	5.5	30	--

Wetlands/Waters of the U.S.

The EFSC is a high gradient perennial stream with substrates consisting of approximately 70% boulders and 30% sand, gravel and cobbles. The creek bisects a forest corridor dominated by lodgepole pine with spruce (*Picea engelmanii*) and Douglas fir (*Abies bifolia*) adjacent to the stream. The narrow streamside riparian/wetland zone has scattered alder (*Alnus* sp.), currant (*Ribes* sp.), willow (*Salix* sp.), bluebells (*Mertensia* sp.), twisted- stalk (*Streptopus amplixifolius*), cow parsnip (*Heracleum sphondylium*), grasses and sedges (*Carex* sp.).

Fish and Wildlife

Fish of Specimen Creek

Yellowstone is home to 13 native fish species and 5 nonnative species. In the Gallatin River drainage, the only native fish are WCT, mountain whitefish (*Prosopium williamsoni*), and mottled sculpin (Varley and Schullery 1998). The nonnative species are brown trout, rainbow trout, and YCT, all introduced by the NPS.

Pre- treatment surveys of fish were conducted on three 100- m sections in the EFSC, two sections on North Fork Specimen Creek, and one section on the mainstem Specimen Creek during 2004- 2005 using backpack electroshockers (Figure 18) (Koel et al. 2005). WCT and mottled sculpin were found in all six sections in the drainage but not in High Lake. Genetic analyses indicated that the WCT were hybridized with rainbow trout and/or YCT (Koel et al. 2005). Population estimates were made from information collected for hybridized trout and mottled sculpin (Table 6). The total population estimate for hybridized trout for the East and North Forks were 2,485 and 1,239 fish, respectively. Nonnative rainbow trout and brown trout were found in the mainstem Specimen Creek, and in the East and North Forks, but at densities too low for completion of accurate population estimates.

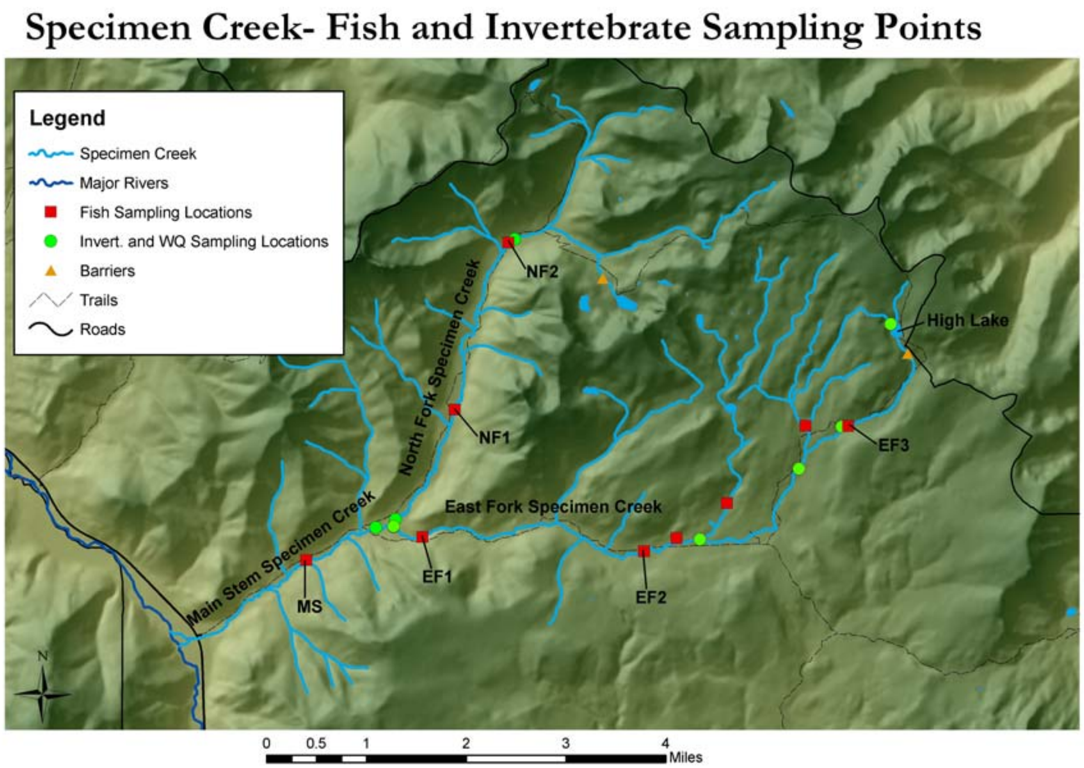


Figure 18. Sites where pre-treatment surveys were conducted for fish, macroinvertebrates (Invert.), and water quality (WQ) in the East Fork (EF), North Fork (NF) and mainstem Specimen Creek.

	HCT			SCU		
Sampling Site	2004	2005	Mean	2004	2005	Mean
MS	11	3	7	104	11	58
EF1	64	8	36	66	N/A*	N/A*
EF2	17	13	15	0	0	0
EF3	15	13	14	0	0	0
NF1	6	4	5	31	23	27
NF2	2	N/A*	N/A*	0	0	0

*Species was captured but at abundances too low to make accurate population estimates.

Table 6. Population estimates (fish per 100 m) from sampling locations throughout Specimen Creek watershed for hybridized westslope cutthroat trout (HCT) and mottled sculpins (SCU). Mottled sculpins were found only in the mainstem and the lower reaches of the East and North Forks.

Characteristic of other headwater stream populations in the area, most of the hybridized WCT sampled were < 200 mm (Figure 19). Their low abundance and small size suggest that productivity in this stream is relatively low. Conductivity (an indirect measure of productivity) never exceeded 50 micromhos/cm, and water temperature was rarely higher than 10°C. The largest fish sampled were two rainbow trout and a brown trout at the mainstem site. This section was also fished on numerous occasions in 2004 as part of the Yellowstone Volunteer Fly- fishing Program (Koel et al. 2005). These directed anglers caught 28 hybridized WCT and 12 rainbow trout during a total of about 850 hours. Lengths of the angler- caught trout in the mainstem section were similar to those collected by the electrofishing survey.

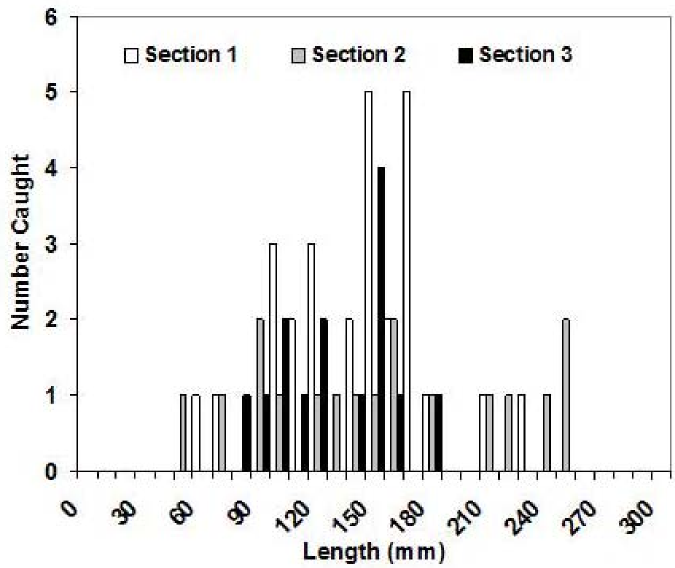


Figure 19. Length-frequency distribution of hybridized WCT captured by electrofishing at three sample sites in the East Fork Specimen Creek, 2004.

Fish of High Lake

The U.S. Fish Commission stocked 16,000 YCT fry into the historically fishless High Lake in August of 1937 from their Bozeman, Montana, Fish Hatchery (Varley 1981). This was a successful attempt to create a recreational opportunity for anglers desiring to experience a backcountry lake fishing experience. Since this one- time stocking, YCT have been able to persist through natural reproduction, most likely spawning in the inlets and connected spring seeps on the north and west shores of the lake (Figure 8).

Two variable- mesh gillnets were set overnight to sample the fish community in High Lake during mid- August of 2005, replicating a similar survey completed in 1970 (USFWS 1971). The 1970 survey caught a total of 58 cutthroat trout in the overnight set. The 2005 survey caught a total of 64 cutthroat trout, ranging in size from 151- 359 mm in length (Figure 20). Age analysis of scales collected in 1970 revealed age classes of fish 1- 3, and during the survey, young- of- the- year trout were seen swimming near the lake outlet (USWFS 1971). Scales collected in 2005 revealed age classes of fish 1- 7, with a preponderance of trout being 2- 4 years old. No other fish species was caught in the 1970 or 2005 survey.

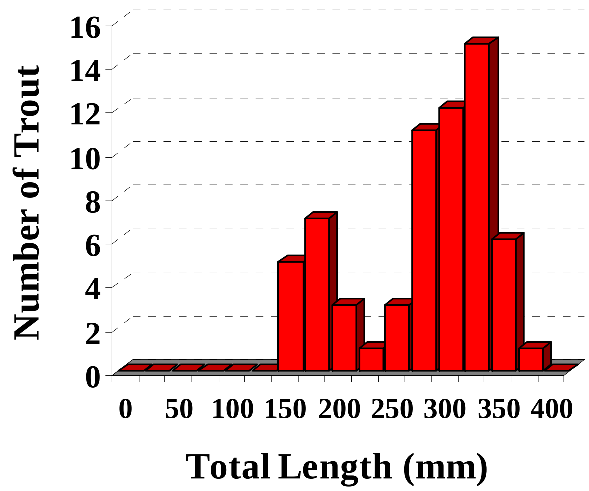


Figure 20. Length-frequency distribution of Yellowstone cutthroat trout captured by variable-mesh gillnets from High Lake, August 2005.

The volunteer angler report card system has information from anglers visiting High Lake in 13 of the last 15 years. Anglers reported catching cutthroat trout at variable rates, with a high of 8 fish per hour in 2005 to a low of just under one fish per hour in 2000. Despite variable catch rates, satisfaction rates for the entire experience have remained near 100% for the anglers fishing High Lake. Anglers reported catching cutthroat trout on every trip to High Lake.

Aquatic Invertebrates

In general, the aquatic invertebrates that are least tolerant of changes in the environment belong to the insect orders Ephemeroptera, Plecoptera, and Trichoptera (EPT taxa), while the most tolerant aquatic invertebrates belong to the insect Orders Diptera, Coleoptera, and Odonata and non- insects such as aquatic worms and mites. During August 2004, 87 invertebrate taxa were collected in six locations in the Specimen Creek watershed (Figure 18). The mainstem had the fewest taxa (39) and the uppermost site on EFSC had the greatest (51). The 10 taxa that were found at all six locations included water mites (*Acari* spp.), two mayflies (*Baetis bicaudatus* and *Cinygmula* spp.), three stoneflies (*Sweltsa* spp., *Zapada columbiana*, and *Zapada oregonensis*), and four midge taxa (*Cricotopus nostococladius*, *Eukiefferiella* spp., *Orthocladius* spp., and *Pagastia* spp.). EPT taxa comprised 53% of the taxa, while midges (Order Diptera, Family Chironomidae) comprised 51% of total invertebrate abundance within the Specimen Creek watershed (Figure 21).

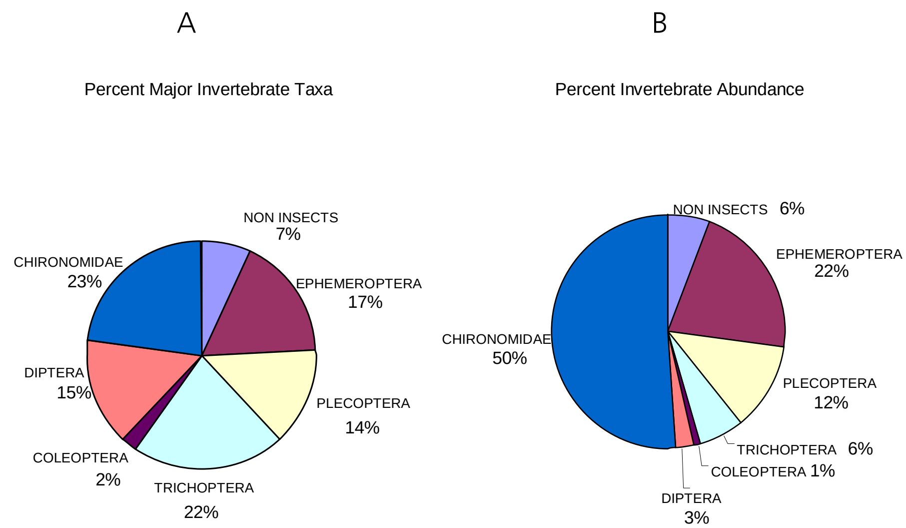


Figure 21. Percent major invertebrate taxa (A) and percent invertebrate abundance (B) belonging to major taxonomic groups collected from the Specimen Creek watershed, August 2004.

During August 2005, additional benthic invertebrate samples were collected from three sites on EFSC and both benthic and pelagic (plankton) samples were collected from several locations in High Lake. A D- frame net was also used to collect information regarding invertebrates from the littoral zone surrounding High Lake. Sediments in High Lake are primarily composed of fine silt and organic material. Benthic invertebrate fauna consisted of midge larvae in the deeper portions of the lake and abundant midge larvae and fingernail clams (Family Sphaeriidae) in shallow areas. Amphipods, fingernail clams, and dragonfly larvae were collected within the littoral zone. Open water areas were dominated by several species of Cladocerans and Copepods, both of which are planktonic crustaceans. The original High Lake invertebrate community was likely greatly altered by the introduction of YCT to this fishless lake in 1937. The current invertebrate fauna is not unique among those of lakes in the region.

Amphibians

Four amphibian species are known to exist in Yellowstone (Patla and Peterson 1999, Koch and Peterson 1995): blotched tiger salamander (*Ambystoma tigrinum melanostictum*), boreal toad (*Bufo boreas boreas*), boreal chorus frog (*Pseudacris triseriata maculate*), and Columbia spotted frog (*Rana luteiventris*). The blotched tiger salamander and boreal chorus frog were not detected in 1999 amphibian surveys conducted in the EFSC. Both the boreal toad and Columbia spotted frog are discussed under the *Species of Concern* impact topic below.

Mammals

Records exist for 60 mammal species throughout the park. Mammals potentially affected by the proposed project include river otter, beaver, mustelids, bears, wolverine, and bats. Population sizes and home ranges are not known for these species within the EFSC watershed.

Birds

Three hundred eighteen bird species have been recorded in Yellowstone since 1872 (McEneaney 2004). The Montana Bird Distribution Database (MNHP 2006) contains records for 90 bird species for the upper Gallatin River area (MNHP 2006). Species that could be potentially affected are those that prey on fish species such as raptors and waterfowl.

Species of Concern

Three species are listed with the Montana Natural Heritage Program as Species of Concern: westslope cutthroat trout, Yellowstone cutthroat trout, and boreal toad. The Columbia spotted frog is listed as a Species of Special Concern in Wyoming.

Westslope cutthroat trout

WCT are designated as a Species of Concern by the MNHP and as a Species of Special Management Concern by the USFWS. WCT populations have declined considerably throughout their historic range during the past century (Miller 1972, Liknes and Graham 1988, Behnke 1992). Numerous stressors, including habitat degradation and fragmentation arising from land use activities have reduced distribution and/or abundance of WCT. The subspecies currently occupies only 19- 27% of its historical range east and west of the Continental Divide in Montana and about 36% of its historical range in Idaho (Shepard et al. 2003; Shepard et al. 2005). Even some of the historically most secure populations in Glacier National Park and the Flathead Basin of Montana are in serious decline (Marnell 1988). In the upper Missouri River drainage, WCT now occupy less than 5% of their historical range (Shepard et al. 1997). The remaining populations persist as small- stream residents occupying isolated habitats ranging from several hundred feet to a few miles in extent. As a result, these populations face a high risk of extinction.

Yellowstone cutthroat trout

Yellowstone cutthroat trout are designated as a Species of Concern by the State of Montana and as Species of Special Management Concern by the USFWS. A range- wide status review (USFWS 2006) estimated that conservation populations (>90% genetic purity) of YCT occupy over 6,300 km within their native range in Idaho, Montana, Nevada, Utah, and Wyoming. Yellowstone cutthroat trout are native to several drainages in Yellowstone National Park, but they are an introduced species and are not native to the Gallatin or Madison river drainages. YCT stocked into several high mountain lakes of the upper Gallatin River drainage in the early and mid- 1900s have since moved downstream, interbred with WCT, and resulted in a serious degradation of WCT genetic integrity. Within Yellowstone, genetically pure YCT are estimated to occupy 65% (2,025 km) of their historic range in streams (Yellowstone National Park unpublished data 2005). Yellowstone Lake, at over 84,000 surface acres, is home to the largest population of YCT in existence.

Boreal toad

The boreal toad is the park's only toad species. Adults can range far from wetlands because of their ability to soak up water from tiny puddles or moist areas, and sometimes are active at night. They lay eggs in shallow, sun- warmed water such as ponds, lake edges, slow streams, and river backwaters. The tadpoles eat aquatic plants; adults eat insects, especially ants and beetles, worms and other small invertebrates. Tadpoles are usually black and often congregate in large groups.

Once common throughout the park, the boreal toad now appears to be rarer than spotted frogs and chorus frogs and it may have experienced a decline in the GYA. The state of Montana MNHP lists as G4T4, which means that globally, this subspecies is uncommon but not rare, although it may be rare in parts of its range, but usually widespread. It is not vulnerable in most of its range, but a possible cause for long- term concern. The MNHP state ranking is S2, which means at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or extirpation in the state. Previous surveys in headwater lakes to the North Fork Specimen Creek in the northwest corner of the park have not found boreal toads. Boreal toads were not detected in the EFSC in 1999 (Patla 2000). High Lake has not been surveyed for boreal toad.

Columbia spotted frog

The Columbia spotted frog is abundant within most of Yellowstone, although it has declined recently in the Lodge Creek area (Deb Patla, University of Idaho unpublished data). They are found all summer along or in rivers, streams, smaller lakes, marshes, ponds, and rain pools. They breed in May or early June, depending on temperatures and lay eggs in stagnant or quiet water, in globular masses surrounded by jelly. Tadpoles mature and change into adults between July and September. Tadpoles eat aquatic plants; adults eat mostly insects but like many other adult amphibians, are highly opportunistic in their food habits.

In 1998 and 1999, surveys were conducted to document amphibian presence in the Bacon Rind, Canyon, Fan, and Specimen Creek watersheds so that potential impacts and benefits to amphibian populations could be considered in native fish restoration projects (Patla 1998, Patla 2000). Surveyed portions of Specimen Creek included large and small streamside meadows, some forested areas, and tributary streams (Table 7, Figure 22). The Columbia spotted frog was detected along some of the Specimen Creek reaches (Patla 1998). Specimen Creek banks and immediately adjacent wet areas are used by spotted frogs for foraging, and frogs possibly overwinter in the stream. Most breeding sites are probably isolated from the main stream, in ponds or ephemeral pools in the meadows or in forest openings. One identified breeding site (site #15, Figure 22) is connected to mainstem Specimen Creek via a small outflow. High Lake was not included in this survey.

A subsequent amphibian survey was conducted in anticipation of using one or more of the high mountain lakes of the Specimen Creek watershed as a WCT refugia. Dr. Charles Peterson, Idaho State University Herpetology Professor, and regional amphibian expert, surveyed the upper North Fork Specimen Creek area, including Crag and Crescent lakes. Although these lakes are in a pristine, fishless condition, no amphibians (tadpoles or adults) were found during this survey (Charles Peterson, Idaho State University, personal communication, 2003). High lake was not included in this survey.

In August 2005, park biologists conducted a qualitative survey for larval amphibians in the lower reaches of EFSC drainage and in the High Lake littoral zone using a D- frame net. No larval amphibians were found (NPS unpublished data, 2005). However, on a subsequent trip by park biologists in September 2005, a single adult Columbia spotted frog was collected in a meadow near High Lake.

Table 7. Results of 1999 amphibian surveys of the Specimen Creek watershed (Patla 2000).

Site No.	Sighting Location	Species Present	Life Stages	Breeding Site?	Notes
6	12 m w of stream	C. Spotted Frog	adult		
7	East arm of meadow, 25 m e. of stream, springs and seeps	C. Spotted Frog	juv		Overwinter site? Many juveniles present, water too cold for breeding site.
8	Between trail and stream.	C. Spotted Frog	juv		At stream edge.
9	Near campsite W1, 6 m north of stream.	C. Spotted Frog	juv		
10	Big meadow near camp W1.	C. Spotted Frog	adult		At stream edge.
11	Big meadow near camp W1, seep at forest edge 60 m south of creek.	C. Spotted Frog	adult		
12	150 m dwnstrm of large mdw.	C. Spotted Frog	unk		At stream edge.
13	Wet meadow	None			
14	5 m downstream of confluence	C. Spotted Frog	adult		At stream edge.
15	Beaver complex s. of creek	C. Spotted Frog	larvae, adult	yes	Site connected to Specimen Cr
A	Pothole	C. Spotted Frog	adult		
B	Pond, w. of tributary stream	C. Spotted Frog	adult, larvae	yes	
C	Trib of E. Specimen	C. Spotted Frog	adult, juv		
D	Wet meadow	None			
E	Pool in sedge wetland	C. Spotted Frog	adult		

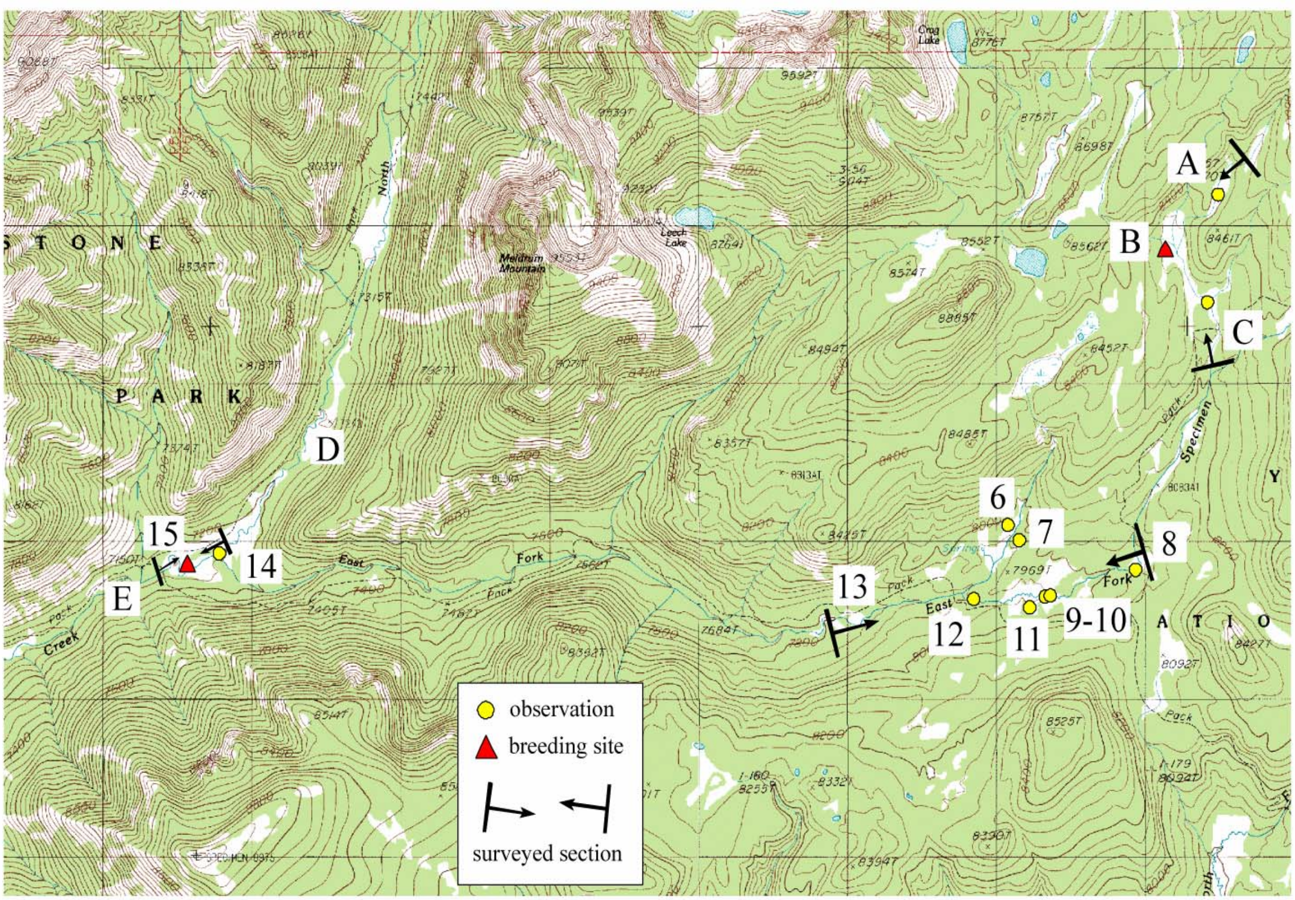


Figure 22. Amphibian observations and survey areas within the Specimen Creek watershed (Patla 2000). Numbers indicate sites identified or surveyed in 1999; letters indicate previous surveys or sites.

Wilderness

In Yellowstone, 2,022,221 acres (91% of the park) are recommended wilderness. The remaining 9% of the park is classified as administrative and facilities, developed areas, and roads. Wilderness areas in the park are classified as designated (2,016,181 acres) or potential (6,040 acres) in the park's Wilderness Recommendation (NPS 1972). NPS Management Policies 2000 state that all wilderness categories, including suitable, study, proposed, recommended, and designated shall be managed for the preservation of the wilderness characteristics, and that the NPS management decisions pertaining to lands qualifying as wilderness will be made in expectation of eventual wilderness designation. All management decisions affecting wilderness will further apply the concepts of "minimum requirements" regardless of wilderness category. All of the EFSC watershed is within the park's recommended wilderness.

Socioeconomic Resources

Approximately 47 outfitters conduct trips in the backcountry in Yellowstone. From 2001- 2005, the number of commercial outfitters conducting trips in the EFSC watershed was 16: 6backpacking and 10 stock (horses and llamas). Overnight commercial trips by these outfitters from 2001- 2005 ranged from 12- 18, with an average of 12.6 per year. The minimum number of commercial outfitter day trips 2003- 2005 averaged 4, with an average number of 23 people and 23 stock.

Visitor Use Including Recreation and Angling

Recreational visitation to Yellowstone has averaged 2.8 to 3 million annual visitors over the past decade. Most of the visitation (70%) occurs from early July to mid- August. Visitor use (75%+) in the park is concentrated in the major developed areas. Only 9% of visitors took a backcountry trail and only 1% used a backcountry campsite. More than 90% of the park is considered backcountry and managed as wilderness. The only developments in the park's backcountry are a relatively sparse trail system, a network of designated campsites, and 43 ranger patrol cabins and lookouts, most of which are defined historic properties.

From 2000- 2004, an annual average of 114 anglers spent an average of 7 angler days in the Specimen Creek watershed (Both East and North Forks), which comprised approximately 0.16% of annual angler days parkwide.

ENVIRONMENTAL CONSEQUENCES

NEPA requires that environmental documents disclose the environmental effects or consequences of a proposed federal action and any adverse impacts that could not be avoided, if the proposed action were implemented. This section of the EA provides a basis for comparing the three alternatives and the impacts that would result from their implementation. Impact topics were selected based on internal and external scoping. This section is based on review of scientific information collected by the NPS, external sources, and scientific literature.

Each impact topic is analyzed for direct, indirect, and cumulative impacts from each of the three alternatives. Impacts are described in terms of context (site specific, local, and/or regional effects), duration (short- term or long- term), timing (direct or indirect), and type (adverse or beneficial). Context, duration, and timing are factored into intensity thresholds (negligible, minor, moderate, major) defined for each impact topic. Definitions of intensity levels vary by impact topic, but the following definitions apply to all impact topics:

Term	Definition
beneficial	a positive change in the condition of the resource or a change that moves a resource toward its desired condition
adverse	a negative change in the condition of the resource or a change that moves a resource away from its desired condition
direct	an effect that is caused by an action and occurs at the same time and place
indirect	an effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable
short- term	an effect which in a short amount of time would no longer be detectable, as a resource returns to its pre- disturbance condition; generally the duration of this project, which is expected to be five years or less.
long- term	a change in a resource or its condition that does not return to pre- disturbance levels and for all practical purposes is considered permanent.

Cumulative Impacts

NEPA regulations require assessment of cumulative impacts in the decision- making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non- federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts for each alternative were analyzed by adding the direct and/or indirect impacts of each impact topic to other past, present, and reasonably foreseeable future actions within the East Fork Specimen Creek watershed and surrounding area. The scope for cumulative impacts varies to some degree for each impact topic.

Impairment

As taken directly from section 1.4.5 in NPS 2001 Management Policies, the impairment that is prohibited by the NPS Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect impacts; the cumulative impacts of the impact in question and other impacts. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent that it affects 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 to opportunities for enjoyment 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 an impairment to the extent that it is an unavoidable result, which cannot reasonably be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values. Impairment may occur from visitor activities, NPS activities in the course of managing a park, or activities undertaken by concessioners, contractors, and others operating in the park.

Each impact topic contains a conclusion statement for each of the three alternatives that summarizes the direct, indirect, and cumulative impacts and whether implementation of the alternative would result in impairment to a park resource or value. Table 8 provides a comparative summary of potential impacts of each alternative.

Table 8. Comparative summary of potential impacts of each alternative.

Impact Topic	Alternative 1 (No Action)	Alternative 2 (Preferred Alternative)	Alternative 3
Health and Human Safety	No direct or indirect impacts. Negligible adverse cumulative impacts.	Direct, short- term, negligible to minor adverse impacts from use of piscicides and helicopters. Negligible to minor adverse cumulative impacts.	Direct, short- term, negligible to minor adverse impacts from use of piscicides and helicopters. Negligible to minor adverse cumulative impacts.
Water Quality	No direct or indirect impacts. Negligible adverse cumulative impacts.	Direct, short- term, negligible to minor adverse impacts from an in- stream barrier and use of piscicides. Negligible to minor adverse cumulative impacts.	Direct, short- term negligible to minor adverse, impacts from an in- stream barrier and use of piscicides. Negligible to minor adverse cumulative impacts.
Wetlands/ Waters of the U.S.	No direct or indirect impacts. Negligible to minor adverse cumulative impacts.	Direct, short- term, negligible adverse impacts from re- routing of stream for in- stream fish barrier. Direct and indirect, long- term, minor adverse impacts from long- term use of fish barrier. Minor adverse cumulative impacts.	Direct, short- term, negligible adverse impacts from re- routing of stream for in- stream fish barrier. Direct and indirect, long- term, minor adverse impacts from long- term use of fish barrier. Minor adverse cumulative impacts.
Fish and Wildlife	No direct or indirect impacts. Short- term, negligible adverse cumulative impacts.	Direct, short- term, minor to moderate adverse impacts to aquatic invertebrates and amphibians. Direct, short- term, minor adverse impacts to mottled sculpin. Direct, short- term negligible to minor adverse impacts to mammals and birds. Minor to moderate adverse cumulative impacts.	Direct, short- term, minor adverse impacts to aquatic invertebrates and amphibians. Direct, short- term, minor, adverse impacts to mottled sculpin. Direct, short- term, negligible to minor adverse impacts to mammals and birds. Minor to moderate adverse cumulative impacts.
Species of Concern	Indirect, long- term (including cumulative) moderate adverse impacts to WCT. No direct or indirect impacts to YCT, boreal toad or Columbia spotted	Direct, long- term, moderate beneficial (including cumulative) impact to WCT. Direct, long- term minor adverse impacts to YCT. Direct, short- term and potentially long- term, minor to moderate adverse impacts to boreal toad and Columbia	Direct, long- term, minor beneficial impact (including cumulative) to WCT. Potential direct, short- term and potentially long- term, minor to moderate adverse impacts to boreal toad and Columbia spotted frog. Potential long- term, minor beneficial impact to boreal toad and Columbia spotted from not

	frog. Short- and long- term, negligible adverse cumulative impacts to YCT, boreal toad, and Columbia spotted frog.	spotted frog. Short- term, potentially long- term, minor to moderate adverse cumulative impacts to boreal toad, and Columbia spotted frog.	introduction WCT into High Lake. Direct, long- term, minor adverse impacts to YCT. Short- term, potentially long- term, minor adverse cumulative impacts to boreal toad and Columbia spotted frog.
Wilderness	No direct or indirect impacts. Negligible to minor adverse cumulative impacts.	Direct, short- term negligible to minor adverse impacts. Direct, long- term, minor to moderate adverse (including cumulative) impacts from in-stream fish barrier.	Direct, short- term, negligible to minor adverse impacts. Direct, long- term, minor to moderate adverse (including cumulative) impacts from in- stream fish barrier.
Socio-economics	No direct, indirect or cumulative impacts.	Negligible to minor adverse (including) cumulative impacts.	Minor adverse (including) cumulative impacts.
Visitor Use Including Recreation and Angling	No direct or indirect impacts. Negligible adverse cumulative impacts.	Direct, short- term, negligible to minor adverse impacts. Negligible to minor adverse cumulative impacts.	Direct, short- term, negligible to minor adverse impacts. Negligible to minor adverse cumulative impacts.

Health and Human Safety

Methodology

Potential impacts from exposure to chemicals that would be used to project personnel, park staff, and visitors within the EFSC, and impacts to downstream surface and groundwater users were analyzed using available literature. The threshold of change for intensity (i.e., degree) of impacts to health and human safety are defined below.

Health and Human Safety Intensity Thresholds	Definition
Negligible	Impacts would be very slight and if detectable, they would be highly localized.
Minor	Impacts would be detectable and relatively localized.
Moderate	Impacts would be detectable and affect a moderate area of the watershed.
Major	Impacts would be significant and affect a majority of the watershed or extend beyond the watershed.

Impacts of Alternative 1 on Health and Human Safety

Impact Analysis: There would be no direct or indirect impacts to health and human safety under Alternative 1 because no project would be implemented.

Cumulative Impact Analysis: Present and future short- term, negligible adverse impacts to health and human safety could occur from visitor use of backcountry trails and campsites and to park staff from routine backcountry maintenance activities and administrative helicopter flights. When combined with the other past, present, and reasonably foreseeable future actions, Alternative 1 would not add any impacts to health and human safety.

Conclusion: No direct or indirect impacts to health and human safety would occur under Alternative 1. Short- term, negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to health and human safety.

Impacts of Alternative 2 on Health and Human Safety

Impact analysis: Both antimycin and rotenone are naturally occurring organic compounds that are used as fish management tools. Antimycin is derived from the bacterium *Streptomyces griseus* while rotenone is derived from Derris root which belongs to the bean (Leguminaceae) family. Both piscicides deprive aquatic gilled organisms of oxygen by interfering with cellular respiration and both are degraded by photolysis (sunlight) and hydrolysis (water movement). Rotenone is highly toxic to fish (2- 20 g/L) with a low toxicity to humans (300- 500 mg/kg) (USFWS 2005). Antimycin is also highly toxic to fish, with salmonids being most susceptible, at application rates as low as 10 ppb. 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. Neither piscicide is known to pose a long- term threat to surface or groundwater quality (USFWS 2005).

A 2.5% $KMnO_4$ solution would be used as an oxidizing agent to detoxify the effects of both piscicides. The application of this product would produce a dark purple color to the treated waters for the duration of each treatment. There are no reports available regarding short- or long- term effects of $KMnO_4$ exposure in humans. The impact of piscicide application and $KMn0_4$ neutralization and subsequent exposure would be short- term, negligible adverse to the public, park staff and project personnel.

The label requirements for rotenone state that public entry into the project area could occur immediately after a completed rotenone treatment. The label requirements for antimycin are more restrictive, proscribing entry until at least 48 hours after caged sentinel fish survive an antimycin and neutralization treatment ($KMnO_4$).

Information signs for visitors and park staff would be posted at the Specimen Creek trailhead and along major trails leading to and through the project area. In addition, the public would be informed as to the nearest location of potable water and/or natural waters that are safe for human consumption. The park would transport potable water to High Lake to provide drinking water to visitors and project personnel as needed.

Liquid emulsifiable formulations of rotenone (Prenfish, Synpren- Fish) have an aromatic solvent odor that is likely due to the associated hydrocarbon solvents such as naphthalene and methylnaphthalene (CDPR 1998) and not the rotenone itself. The odor may last for several days depending on climatic conditions, but it has not been linked to any human health problems (Finlayson et al 2000). CFT Legumine (Prentox Inc.) may have less odor compared with other liquid rotenone formulations because of the reduction of hydrocarbon- based solvents. Powdered rotenone (Prentox Inc.) has an odor of wet chalk or a dirt- like odor that lasts for several days. All of these types of rotenone would likely be used under Alternative 2. Antimycin has an acetone odor that could last up to several days. Potassium permanganate ($KMnO_4$) is an odorless oxidizer often used to remove foul tastes and odors from drinking water. Impacts to health and human safety from odors are anticipated to be direct, short- term, and negligible adverse.

An accidental spill of rotenone in the High Lake treatment area could be contained within the immediate vicinity. The outlet to High Lake above the waterfall has a relatively low discharge during the proposed treatment period, and most of the rotenone would remain within the main lake basin until degraded. If rotenone were to pass through the outlet, it could be safety neutralized by the $KMmO_4$ station that would be established near the lake outlet. Project personnel would staff the treatment and $KMnO_4$ stations 24 hours per day until the neutralization is complete.

An accidental spill within the treatment area of Specimen Creek could produce direct, short- term minor adverse impacts within the immediate project area. However, because antimycin breaks down quickly by photolysis and hydrolysis, particularly in fast- moving waters, these impacts would be minimal to downstream areas. Water from nearby tributary streams and freshwater springs would contribute to the breakdown of antimycin through dilution.

To mitigate impacts of piscicides and $KMnO_4$ exposure to project personnel, they would all wear safety equipment and be trained on the safe handling and application of the piscicides and $KMnO_4$. Safety equipment includes eye and skin protection and a respirator. Chemicals would be transported, handled, applied and stored according to the label specifications to reduce the possibility of human exposure or spill. The attached Safety and Health Plan (Appendix A) includes procedures to follow in case of an accidental spill and the required safety equipment to be used by project personnel.

Cumulative Impact Analysis: Potential present and future short- term, negligible to minor adverse impacts to health and human safety could result from visitor use of backcountry trail systems and backcountry campsites and to park staff from routine backcountry maintenance activities and administrative helicopter flights. When combined with the other past, present, and reasonably foreseeable future actions, Alternative 2 would add direct, short- term, negligible adverse impacts to project personnel from exposure and short- term, negligible adverse impacts to visitors and other staff.

Conclusion: Alternative 2 would have direct, short- term, negligible to minor adverse impacts and negligible to minor adverse cumulative impacts to health and human safety. Because there would be no unacceptable impacts, there would be no impairment to health and human safety.

Impacts of Alternative 3 on Health and Human Safety

Impact Analysis: Impacts would be the same as for Alternative 2 (Preferred Alternative). Alternative 3 includes the same project components (piscicides, neutralization agent, and helicopter flights) as those analyzed under Alternative 2.

Cumulative Impact Analysis: Potential present and future short- term, negligible to minor adverse impacts to health and human safety could result from visitor use of backcountry trail systems and backcountry campsites and to park staff from routine backcountry maintenance activities and administrative helicopter flights. When combined with the other past, present, and reasonably foreseeable future actions, Alternative 3 would add direct, short- term, negligible to minor adverse impacts to project personnel from exposure and short- term, negligible to minor adverse impacts to visitors and other staff.

Conclusion: Alternative 3 would have direct short- term negligible to minor adverse impacts and negligible to minor adverse cumulative impacts to health and human safety. Because there would be no unacceptable impacts, there would be no impairment to health and human safety.

Water Quality

Methodology

Water samples collected in 2004 and 2005 in the ESFC have been analyzed for baseline data on water temperature, dissolved oxygen, pH, specific conductance, and turbidity. Water samples would be collected and analyzed for these quality parameters in 2006 and before and after the piscicide/neutralization treatments for both High Lake and ESFC. The threshold of change for intensity (i.e., degree) of impacts to water quality are defined below.

Water Quality Intensity Thresholds	Definition
Negligible	Impacts would be very slight, and if detectable, would be highly localized. No impacts are expected to occur to water temperature, dissolved oxygen, and pH. A slight increase in turbidity may occur during piscicide treatments. A slight increase in specific conductance may occur due to the $KMnO_4$ application.
Minor	Impacts would be detectable and affect a small area of the watershed. Some minor increases to one or more water quality parameters may occur but would not exceed federal standards.
Moderate	Impacts would be detectable and affect a moderate area of the watershed. Mitigation measures would be needed to avoid exceeding federal standards for one or more water quality parameters.
Major	Impacts would be significant and affect a large portion of the watershed or extend beyond the watershed.

Impacts of Alternative 1 on Water Quality

Impact Analysis: There would be no direct or indirect impacts to water quality under Alternative 1 because no project would be implemented.

Cumulative Impact Analysis: Past, present and future use in the EFSC watershed from stock, angling and camping contribute short- and long- term negligible adverse impacts to water quality, primarily through slight increases in turbidity from trail use and riparian degradation. Short- and long- term, negligible adverse impacts from nutrients and fecal coliforms could result from stock and camping use. When added to the other past, present and reasonably foreseeable future actions in the EFSC watershed, Alternative 1 would not add any impacts to water quality.

Conclusion: No direct or indirect impacts to water quality under Alternative 1 would occur because no project would be implemented. Short- and long- term, negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to water quality.

Impacts of Alternative 2 on Water Quality

Impact Analysis: The application of piscicide to High Lake and EFSC, as well as barrier construction, would occur during low flow periods of August and September. Treatment of High Lake and EFSC with piscicides would have no impacts to water temperature, dissolved oxygen, or pH. Specific conductance may be affected slightly due to the ionic nature of $KMnO_4$, which would be used to detoxify the piscicide downstream of the treatment area. Slight to minor increases in specific conductance would have a negligible impact to aquatic biota. The piscicide and associated organic solvents, which are added to piscicides as dispersing agents, could have a short- term, minor adverse impact to water quality within the immediate treatment area. However, the piscicide and associated organic solvents (semi- volatile or volatile compounds) degrade rapidly. Turbidity could increase slightly from the piscicide treatments and $KMnO_4$ application within the project area. Any increases in turbidity would be direct, short- term, and minor adverse and confined to the immediate project area. Barrier construction is anticipated to take place during September when stream flows are at a minimum and after the resident fishes have spawned. Sediment releases caused by in- stream disturbance during barrier construction would be direct, short- term and negligible adverse.

Cumulative Impact Analysis: Past, present and future use in the EFSC watershed from stock, angling and camping contribute short- and long- term negligible adverse impacts to water quality, primarily through slight increases in turbidity, nutrients, and fecal coliforms from trail use and riparian degradation. Long- term negligible to minor adverse impacts from nutrients and fecal coliforms could result from stock and camping use. When added to the other past, present and reasonably foreseeable future actions in the EFSC watershed, Alternative 2 would add direct, short- term, negligible adverse impacts to water quality. There would be no long-term adverse impacts to water quality.

Conclusion: Alternative 2 would have direct, short- term, negligible to minor adverse impacts. Short- and long- term negligible to minor adverse cumulative impacts could occur if recreational use of the watershed increases. Because there would be no unacceptable impacts, there would be no impairment to water quality under Alternative 2.

Impacts of Alternative 3 on Water Quality

Impact Analysis: Impacts to water quality would be the same as for Alternative 2 (Preferred Alternative). The piscicide and associated organic solvents would have minor, short- term, adverse impacts to water quality within the project area from potential slight increases in specific conductance and turbidity.

Cumulative Impact Analysis: Past, present and future use in the EFSC watershed from stock, angling and camping contribute short- and long- term negligible adverse impacts to water quality, primarily through slight increases in turbidity from trail use and riparian degradation. Short- and long- term negligible adverse impacts from nutrients and fecal coliforms could result from stock and camping use. When added to the other past, present and reasonably foreseeable future actions in the EFSC watershed, Alternative 3 would add direct, short- term negligible to minor adverse impacts to water quality.

Conclusion: Alternative 3 would have direct, short- term, negligible to minor adverse impacts. Short- and long- term, negligible to minor adverse cumulative impacts could occur to water quality if recreational use of the watershed increases. Because there would be no unacceptable impacts, there would be no impairment to water quality under Alternative 3.

Wetlands/Waters of the U.S.

Methodology

Executive Order 11990 requires federal agencies to avoid, where possible, adversely impacting wetlands. NPS Director's Order 77- 1 and the accompanying Procedural Manual (DO 77- 1) contain the NPS procedures for implementing this executive order. Proposed actions that have the potential to adversely impact wetlands must be addressed in a Statement of Findings and included in an EA. Section 4.2 of DO 77- 1 list certain water- dependent actions that do not require preparation of a Statement of Findings. These include "[A]ctions designed specifically for the purpose of restoring degraded (or completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes." Temporary disturbances to wetlands that are directly associated with and necessary for implementing the restoration are allowed under this exception, and actions causing a cumulative total of up to 0.25 acres of new long- term adverse impacts on natural wetlands may be allowed under this exception if they are directly associated with and necessary for the restoration such as small structures or berms, and provided conditions stated in Appendix 2 of Section are satisfied. DO 77- 1 indirectly defines "adverse" impacts to be "minimal" impacts greater than negligible for purposes of a Statement of Findings.

NPS polices require protection of waters of the U.S. through Section 404 of the Clean Water Act, which authorizes the discharge of dredged or fill material or excavation within U.S. waters.

The threshold of change for intensity (i.e., degree) of impacts to wetlands/waters of the U.S. are defined below.

Wetlands/Waters of the U.S. Intensity Thresholds	Definition
Negligible	Impacts would be very slight, and if detectable, would be highly localized.
Minor	Impacts would be detectable and affect a small area of the watershed.
Moderate	Impacts would be detectable and affect a moderate area of the watershed.
Major	Impacts would be significant and affect a large area of the watershed or extend beyond the watershed.

Impacts of Alternative 1 on Wetlands/Waters of the U.S.

Impact Analysis: There would be no direct or indirect impacts to wetlands/waters of the U.S. because the project would not be implemented.

Cumulative Impact Analysis: Past, present and future use in the EFSC watershed contribute to negligible to minor adverse impacts to wetlands from backcountry hiking and human and stock use of trails and campsites at High Lake. When added to the other past, present and reasonably foreseeable future actions, Alternative 1 would not add any impacts.

Conclusion: No direct or indirect impacts would occur because the project would not be implemented. Short- and long- term, negligible to minor adverse cumulative impacts would result from backcountry use in the watershed. Because there would be no unacceptable impacts, there would be no impairment to wetlands/waters of the U.S.

Impacts of Alternative 2 on Wetlands/Waters of the U.S.

Impact Analysis: Based on habitat measurements collected in 2004 and 2004 by the park's fisheries staff and photos of the proposed site, an estimated maximum of 0.122 acres of new direct and indirect, long- term, minor adverse impacts would result from construction and long-term use of a six- foot barrier and the permanent submerging of riparian vegetation immediately upstream of the fish barrier. Direct, short- term, negligible adverse impacts would occur to wetlands/waters of the U.S. as a result of temporarily diverting the streamflows around the fish barrier construction of the site.

Temporary disturbances to wetlands directly associated with and necessary for the proposed fish restoration project would result from re- routing of the stream to construct the fish barrier. A Statement of Findings will not be prepared because the purpose of the proposed project is to restore an ecological process, temporary impacts are directly associated with the restoration, and cumulative impacts are not anticipated to amount to 0.25 acres of new long- term adverse impacts. The park's wetland biologist will conduct a wetland delineation prior to construction of the barrier during year 1, planned for 2006, to confirm that new long- term cumulative impacts would not total 0.25 acres or greater. The wetland delineation method will conform to the January 1987 Corps of Engineers Wetlands Delineation Manual and the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands.

Yellowstone submitted a Joint Application for work in Montana's Streams, Wetlands, Floodplains, and Other Water Bodies to the appropriate state agencies in March 2006. The Joint Application includes a 404 General Regional Permit for construction of the fish barrier in the lower reach of EFSC, 318 Authorization and Montana Streambed Protection Act 124 Permit.

Cumulative Impact Analysis: Past, present and future actions potentially occur to wetlands from backcountry hiking and human and stock use of trails and campsites result in negligible to minor adverse impacts. When added to the other past, present and reasonably foreseeable future actions, Alternative 2 would add direct, short- term, negligible adverse impacts and indirect, long- term, negligible adverse impacts, resulting in minor adverse cumulative impacts.

Conclusion: Direct, short- term, negligible adverse impacts would occur from the temporary stream diversion and an indirect, long- term, minor adverse impact would occur from the permanent ponding. Negligible to minor adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to wetlands or waters of the U.S.

Impacts of Alternative 3 on Wetlands/Waters of the U.S.

Impact Analysis: The direct and indirect impacts to wetlands/waters of the U.S. would be the same as for Alternative 2 (Preferred Alternative). Direct and indirect, long- term, minor adverse impacts would result from construction and long- term use of a six- foot barrier and direct, short- term, negligible adverse impacts would occur to wetlands/waters of the U.S. as a result of temporarily diverting streamflows around the fish barrier construction site.

Similar to Alternative 2, a Statement of Findings will not be prepared. The park's wetland biologist will conduct a wetland delineation prior to construction of the barrier to confirm that new long- term cumulative impacts would not total 0.25 acres or greater. The wetland delineation method will conform to the January 1987 Corps of Engineers Wetlands Delineation Manual and the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands.

Cumulative Impact Analysis: The cumulative impacts to wetlands would be the same as for Alternative 2 (Preferred Alternative). When added to the other past, present and reasonably foreseeable future actions, Alternative 3 would add direct, short- term, minor adverse impacts and indirect, long- term, negligible adverse impacts.

Conclusion: Short- term direct negligible adverse impacts and indirect long- term minor adverse impacts would occur. Minor adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to wetlands or waters of the U.S.

Fish and Wildlife

Methodology

Impacts to mottled sculpin, nonnative trout, aquatic invertebrates, amphibians, mammals, and birds are analyzed in this impact topic, based on the knowledge of park resource specialists and current literature. Impacts to WCT, YCT, Columbia spotted frog, and boreal toad are analyzed under the *Species of Concern* impact topic. The threshold of change for intensity (i.e., degree) of impacts to fish and wildlife are defined below.

Fish and Wildlife Intensity Thresholds	Definition
Negligible	Impacts to individuals would be slight, and if detectable, would be highly localized.
Minor	Impacts would be detectable and relatively localized, affecting a small proportion of the population(s) in the park.
Moderate	Impacts on a population level could occur, affecting a moderate proportion of the population(s) in the park.
Major	Impacts on a population level would be significant, affecting a major proportion of the population in the park.

Impacts of Alternative 1 on Fish and Wildlife

Impact Analysis: There would be no direct or indirect impacts to fish and wildlife species under Alternative 1 because no project would be implemented.

Cumulative Impact Analysis: Past, present and future actions including visitor backcountry recreational use, angling, routine backcountry maintenance activities, administrative flights, and fisheries management downstream in the Gallatin River contribute to direct and indirect negligible adverse cumulative impacts to fish and wildlife. When added to the other past, present, and reasonably foreseeable future actions, Alternative 1 would not add any impacts to fish and wildlife because no project would be implemented.

Conclusion: There would be no direct or indirect impacts to fish and wildlife species under Alternative 1. Short- term, negligible, adverse cumulative impacts are expected to occur from recreational use and administrative management. Because there would be no unacceptable impacts, there would be no impairment to fish and wildlife.

Impacts of Alternative 2 on Fish and Wildlife

Impact Analysis:

Fish

Mottled sculpin would be removed from all waters upstream of the EFSC fish barrier by chemical treatment and then restocked from source populations downstream as a part of the native species recovery to the project area. The barrier would not greatly affect movement of mottled sculpins, as these species typically exhibit only limited movement in stream systems such as Specimen Creek (<209 m in Chamberlain Creek, Montana; Schmetterling and Adams 2004). There would be a direct, short- term, minor adverse impact on mottled sculpin due to chemical treatment and removal of all fish from the EFSC and its tributaries. The fish barrier would have an indirect, long- term negligible adverse impact on mottled sculpins. It is anticipated that most aquatic invertebrates, which are food for mottled sculpins, would repopulate the treated stream reaches within a few months after treatment from source populations located in upstream, fishless, untreated reaches of tributary streams and/or from untreated stream reaches located downstream and away from the treatment area. Impacts from temporary loss of food for mottled sculpins are expected to be direct, short- term, and minor adverse.

Nonnative brown and rainbow trout would be removed from all waters upstream of the fish barrier during chemical treatment and, if the project is successful, would never repopulate the area. The impacts to these species would be direct, long- term, and negligible adverse, due to the fact that both rainbow trout and brown trout exist at very low densities in the EFSC watershed.

Aquatic Invertebrates

Much of the information available on impacts of these chemicals to non- target species including aquatic invertebrates exists in the form of graduate theses, agency reports, or other gray literature. Studies of response/recovery of non- target species is lacking for the environmental setting and the specific water types of high elevation streams and lakes in southwest Montana.

Rotenone, antimycin, and potassium permanganate (KMnO4), have short- term impacts on non- target species and to aquatic invertebrates in particular (Chandler and Marking 1982, Moore et al. 2005). Antimycin is generally regarded as having less short- term impact on non- target invertebrates than rotenone (Moore et al. 2005) due to its shorter half- life. The detoxifying agent KMnO4, a strong oxidizer required when either of these chemicals is used in flowing waters, also can reduce the abundance of certain invertebrate species. In these stream environments, not all of the loss is due to death of the animals because the chemicals can cause increases in invertebrate drift downstream (Morrison 1977, Cerreto 2004). Quick recovery (< 1 year) to pre- treatment invertebrate levels has been documented following treatment by rotenone (Ling 2003), antimycin (Walker 2003), and $KMnO_4$ (Moore et al. 2005), but not in all studies. For example, an often cited study on the Strawberry River, Utah, by Mangum and Madrigal (1999) provides strong evidence that invertebrates significantly declined and had not fully recovered five years after treatment with rotenone. The rotenone for that project, however, was applied at a concentration of three times recommended for normal stream use; 150 ppb active rotenone was used following the product label for a pre- impoundment treatment above a dam, whereas 50 ppb active rotenone is recommended by the product label for other, normal stream use. It is also worth noting that the product label recommends 4- 8 hours of continuous application for normal stream use, whereas the Strawberry River rotenone applications occurred continuously for 48 hours. The extremely high rotenone concentration used in Strawberry River limits the utility of comparing these results to that observed in other pre/post treatment studies.

The piscicide treatments in the EFSC would likely result in short- term removal of the aquatic invertebrates that inhabit the stream reaches. It is anticipated that most aquatic invertebrates would repopulate the treated stream reaches within a few months after treatment from source populations located in upstream, fishless, untreated reaches of tributary streams and/or from untreated stream reaches located downstream and away from the treatment area. Impacts to aquatic invertebrates are expected to be direct, short- term, and minor to moderate adverse.

Amphibians

Because both antimycin and rotenone enter aquatic animals across the gill membrane, larval amphibians are highly susceptible to them. Larval amphibians undergoing metamorphosis, particularly during early to middle stages, would not be expected to survive the chemical treatments in the EFSC or High Lake. Long- lived amphibians, such as the boreal chorus frog and blotched tiger salamander may have only 2- 3 good breeding years out of every ten. Because the planned chemical treatments are concurrent for several years, long- term reproduction could be affected. Only Columbia spotted frog was detected in previous surveys in 1999. High Lake was not included in these 1999 surveys but was surveyed in 2003 and 2004 by park fisheries biologists. None were detected. It is anticipated that impacts to amphibians would be direct, short- term and potentially long- term, and minor to moderate adverse from the use of the piscicides.

The park will conduct a survey of breeding amphibians in High Lake, its inlets, connected spring seeps and wet meadows, and the outlet downstream to the waterfall from June 15- July 31 of year 1 (planned for 2006). Methods to be used will follow that of previous park surveys by University of Idaho amphibian authorities Charles Peterson and Debra Patla (Patla 1998, Patla 1999, Patla and Peterson 1999). Data acquired will be provided to the USGS and incorporated into the Amphibian Research and Monitoring Initiative (ARMI) database (USGS 2006).

To mitigate impacts to amphibians, any amphibians that are found in waters to be chemically treated would either be removed to nearby standing waters that would not be chemically treated, or held in containers away from the treatment area until waters are judged safe for their return, if either of these methods is determined appropriate. In any case of amphibian movement, hygiene protocols to prevent disease in frogs would be used (Berger et al. 2004). Debra Patla, who is leading the long- term amphibian monitoring in the park as part of the NPS Vital Signs Monitoring Program, will be consulted on all aspects of amphibian conservation for the EFSC WCT project.

Mammals and Birds

The piscicides antimycin and rotenone are not known to be toxic to mammals or birds at the concentrations in water used to remove fish. Therefore, impacts from ingestion of these waters are anticipated to be direct, short- term, and negligible adverse. The small beaver- dam style EFSC fish barrier would not impede the movements of any mammal or bird species due to its small size. Fish- eating mammals and birds may be displaced for 4- 6 years to nearby fish-containing waters such as the mainstem or North Fork Specimen Creek, the Gallatin River, or other nearby streams and lakes during fish removal and restoration of WCT in the EFSC watershed, resulting in direct, short- term, negligible to minor adverse impacts to mammals.

Barrow's goldeneye (*Bucephala islandica*) is a cavity- nesting sea duck that breeds in High Lake as well as in other headwater lakes in the surrounding area. The critical nesting period for this species is early June through mid- July when it lays its eggs in trees. It feeds primarily on submerged aquatic vegetation but also eats mollusks, crustaceans, fish and insects. The planned piscicide treatments are scheduled to begin in early August, after their breeding season. Project operations in the lake may displace some feeding activities but will not impact nesting activities. Impacts to Barrow's goldeneye are expected to be direct, short- term, and negligible to minor adverse.

Cumulative Impact Analysis: Past, present and future actions including visitor backcountry recreational use, angling, routine backcountry maintenance activities, administrative flights, and fisheries management downstream in the Gallatin River contribute to direct and indirect negligible adverse cumulative impacts to fish and wildlife. When added to the other past, present, and reasonably foreseeable future actions, Alternative 2 would add direct, short- term and long- term, negligible to moderate adverse impacts to fish and wildlife.

Conclusion: Alternative 2 would result in direct, short- term, minor adverse impacts to mottled sculpin; direct, long- term, negligible adverse impacts to nonnative trout; direct, short- term, minor to moderate adverse impacts to aquatic invertebrates and amphibians; and direct, short-term, negligible to minor adverse impacts to mammal and bird species. Alternative 2 would result in direct, short- and long- term, minor to moderate adverse impacts to fish and wildlife.

Impacts of Alternative 3 on Fish and Wildlife

Impact Analysis:

Impacts under Alternative 3 to fish and wildlife species would be the same as under Alternative 2, except for aquatic invertebrates and amphibians, due to High Lake remaining in a fishless condition.

Aquatic Invertebrates

The piscicide treatments in the EFSC would result in a complete removal of aquatic invertebrates. However, it is anticipated that most aquatic invertebrates would repopulate the treated stream reaches quickly within a few months after treatment from source populations located in upstream, fishless, untreated reaches of tributary streams and/or from untreated stream reaches located downstream and away from the treatment area. Impacts to aquatic invertebrates are expected to be direct, short- term, and minor to moderate adverse.

Amphibians

Similar to Alternative 2, impacts to amphibians would be direct, short- term and potentially long- term, minor to moderate adverse from the use of the piscicides under Alternative 3. However, under Alternative 3, the introduced YCT would be removed from High Lake and the genetically pure WCT would not be introduced there. An indirect, long- term, minor beneficial impact to amphibians is expected from the removal of introduced fish that prey on amphibians (Pilliod and Peterson 2000, Pilliod and Peterson 2001).

Cumulative Impact Analysis: Past, present and future actions including visitor backcountry recreational use, angling, routine backcountry maintenance activities, administrative flights, and fisheries management downstream in the Gallatin River contribute to direct and indirect negligible adverse cumulative impacts to fish and wildlife. When added to the other past, present, and reasonably foreseeable future actions, Alternative 3 would add direct, short- term and long- term negligible to moderate adverse impacts to fish and wildlife. Alternative 3 could add an indirect, long- term, minor beneficial impact to aquatic invertebrates and amphibians by not introducing WCT into High Lake.

Conclusion: Alternative 3 would result in direct, short- term, minor adverse impacts to mottled sculpin; direct, long- term, negligible adverse impacts to nonnative trout; direct, short- term, negligible to minor adverse impacts to aquatic invertebrates; direct, short- term and potentially long- term, minor to moderate adverse impacts to amphibians; and direct, short- term negligible to minor adverse impacts to mammal and bird species. Alternative 3 could add an indirect, long- term minor beneficial impact to aquatic invertebrates and amphibians from not introducing WCT into High Lake.

Species of Concern

Methodology

Impacts to Montana Species of Concern and the Columbia spotted frog (Wyoming Species of Concern) were analyzed based on scientific literature and the knowledge of park and other resource specialists for the EFSC watershed. The threshold of change for intensity (i.e., degree) of impacts to Species of Concern are defined below.

Species of Concern Intensity Thresholds	Definition
Negligible	Impacts to one or more individuals would be very slight, and if detectable, would be highly localized.
Minor	Impacts to one or more individuals of a species would be detectable, but relatively localized, affecting a small proportion of the population(s) in the park.
Moderate	Impacts could occur at the population level, affecting a moderate proportion of the population(s).
Major	Impacts would be significant, affecting a large proportion of the population(s).

Impacts of Alternative 1 on Species of Concern

Impact Analysis: There would be no direct or indirect impacts to YCT, boreal toad or Columbia spotted frog under Alternative 1 because no project would be implemented.

An indirect, long- term moderate adverse impact to WCT would occur as a result of not removing nonnative and hybridized trout, constructing a fish barrier, or restoring genetically pure WCT to EFSC and High Lake. By allowing the continued movement of nonnative and hybridized trout upstream into the drainage from the mainstem Specimen Creek, and the continued downstream movement of introduced YCT from High Lake, the genetic status of WCT in the park would continue to degrade. All fish movements within the drainage would continue at present levels, so any trout existing downstream in the Gallatin River with migratory life history strategies would be able to move freely into the EFSC.

Cumulative Impact Analysis: Past, ongoing and future actions from backcountry recreational use and maintenance and administrative flights contribute to negligible adverse cumulative impacts to YCT, boreal toad and Columbia spotted frog. An indirect, long- term moderate adverse cumulative impact would occur to WCT from continued genetic degradation. When added to the other past, present, and reasonably foreseeable future actions, Alternative 1 would add an indirect, long- term, moderate adverse cumulative impact to WCT.

Conclusion: Alternative 1 would have no direct or indirect impacts to YCT, boreal toad or Columbia spotted frog. Short- and long- term, negligible adverse cumulative impacts would occur to these species. Alternative 1 would have long- term, indirect (including cumulative) moderate adverse impacts on WCT within the park because the genetics of the WCT within the EFSC would continue to degrade. Because Alternative 1 would not result in unacceptable impacts, there would be no impairment to a state Species of Concern.

Impacts of Alternative 2 on Species of Concern

Impact Analysis:

Yellowstone cutthroat trout

Although the number of genetically pure YCT populations in the park has declined by approximately 35% over the last century (Yellowstone National Park unpublished data), several large populations of genetically pure YCT exist in the park, most notably in the Yellowstone Lake Basin, but also in the upper Lamar River and other locations.

The introduced YCT population in High Lake represents less than 0.008% of the total surface area of lakes occupied by YCT in the park. These YCT also exist outside of the species' native range and are isolated from any other population of genetically pure YCT in the park. These factors marginalize the importance of the High Lake population to the overall status of YCT in the park or within the region. Under Alternative 2, the High Lake population would be completely removed by piscicide treatments, and genetically pure WCT would be introduced into High Lake. Alternative 2 would have a direct, long- term, minor adverse impact on YCT in the park, because although miniscule for the populations overall in the park, the impacts on a local scale would be permanent.

Westslope cutthroat trout

Despite their historically wide distribution in the Gallatin and Madison River drainages of the park, only one population of genetically pure WCT is currently known to exist, in an unnamed tributary to Grayling Creek (Figure 2). Based on testing done in 2005, this population is 100% genetically pure. Gametes from this WCT core population may be collected for stocking EFSC and High Lake by taking a partial spawn of up to 10 females each year. Direct, short- term adverse impacts to this WCT population are not expected to exceed minor adverse. If found through continued surveys and genetic testing, any genetically pure WCT (gametes, juveniles, and/or adults) of North Fork Fan Creek could also be used for stocking of EFSC and/or High Lake. Direct, short- term, adverse impacts to this population are not expected to exceed minor adverse.

The EFSC is within the native range of WCT and has an estimated population of 2,485 hybridized WCT that are less than 80% genetically pure (20% rainbow trout/YCT). However, no genetically pure WCT exist today in EFSC. High Lake, despite being the headwater lake to

ESFC, lies upstream of a waterfall and was historically fishless. High Lake is not within the known historic range of WCT. The reintroduction of WCT to the EFSC to establish a second core population, and the creation of a refuge population of WCT in High Lake would have a direct, long- term, moderate beneficial impact on WCT in the park and in the region.

Boreal toad and Columbia spotted frog

Because both antimycin and rotenone enter aquatic animals across the gill membrane, larval amphibians are highly susceptible to them. Larval amphibians undergoing metamorphosis, particularly during early to middle stages, would not be expected to survive the chemical treatments. Long- lived amphibians, such as the boreal toad and Columbia spotted frog, may have only 2- 3 good breeding years. Because the planned chemical treatments are concurrent for several years, the reproduction of this species could be affected. It is anticipated that impacts to the boreal toad would be direct, short- term and potentially long- term, and minor to moderate adverse from the use of the piscicides.

The park will conduct a survey of breeding amphibians in High Lake, its inlets and connected spring seeps and wet meadows, and the outlet downstream to the waterfall from June 15- July 31 in year 1 (planned for 2006). Methods will follow that of previous park surveys by University of Idaho amphibian authorities Charles Peterson and Debra Patla (Patla 1998, Patla 1999, Patla and Peterson 1999). Data acquired will be provided to the USGS and incorporated into the ARMI database (USGS 2006).

To mitigate impacts to amphibians, any amphibians that are found would either be removed to nearby standing waters that would not be chemically treated, or held in containers away from the treatment area until waters are judged safe for their return, if either of these methods is determined appropriate. Hygiene protocols to prevent disease in frogs would be used if amphibians are moved by park personnel (Berger et al. 2004). Debra Patla, who is leading the long- term amphibian monitoring in the park as a part of the NPS Vital Signs Monitoring Program, will be consulted on all aspects of amphibian conservation for the EFSC WCT project.

Cumulative Impact Analysis: Past, present and future actions from recreational backcountry use and maintenance, and administrative flights contribute to direct, short- term, negligible adverse cumulative impacts to WCT, YCT, boreal toad and Columbia spotted frog. When added to the other past, present, and reasonably foreseeable future actions, Alternative 2 would add direct, short- term and potentially long- term, minor to moderate adverse impacts to boreal toad and Columbia spotted frog, direct, long- term, negligible to minor adverse impacts to YCT, and direct, long- term, moderate beneficial impacts to WCT.

Conclusion: Alternative 2 would have direct, short- and long- term, minor to moderate adverse impacts to boreal toad and Columbia spotted frog. Alternative 2 would have a direct, long- term, minor adverse impact to YCT, and a direct, long- term, moderate beneficial impact on WCT in the park and in the region. Minor to moderate adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to a state Species of Concern.

Impacts of Alternative 3 on Species of Concern

Impact Analysis:

Yellowstone cutthroat trout

Under Alternative 3, impacts to YCT would be the same as for Alternative 2. Alternative 3 would have a direct, long- term, minor adverse impact on YCT in the park, because although miniscule for the populations overall in the park, the impacts would be on a local scale would be permanent.

Westslope cutthroat trout

Under Alternative 3, genetically pure WCT would be reintroduced into EFSC but not introduced into High Lake resulting in a return to its historically fishless condition. Not introducing genetically pure WCT into High Lake would reduce the risk of long- term extinction within the park; however, the reintroduced WCT within the East Fork would only be moderately secure due to the absence of any upstream source of WCT in the watershed. The reintroduced WCT population would be somewhat vulnerable to future loss if a watershed-scale disturbance such wildfire, drought, and/or flood occurred. Loss through genetic degradation or competition by nonnative trout could occur if the EFSC fish barrier failed in the future. Alternative 3 would result in a direct, long- term, minor beneficial impact to WCT.

Boreal toad and Columbia spotted frog

Similar to Alternative 2, potential impacts to the boreal toad and Columbia spotted frog would potentially be direct, short- term and potentially long- term, and minor to moderate adverse from the use of the piscicides. However, under Alternative 3, the introduced YCT would be removed from High Lake and WCT would not be introduced there. An indirect, long- term, minor beneficial impact to the boreal toad and Columbia spotted frogs could occur from the removal of introduced fish that prey on amphibians (Pilliod and Peterson 2000, Pilliod and Peterson 2001).

Cumulative Impact Analysis: Past, present and future actions from recreational backcountry use and maintenance, and administrative flights contribute to direct, short- term, negligible adverse cumulative impacts to YCT, boreal toad and Columbia spotted frog. When added to the other past, present, and reasonably foreseeable future actions, Alternative 3 would add minor adverse impacts to YCT, minor to moderate adverse impacts boreal toad and Columbia spotted frog, minor beneficial impacts to boreal toad and Columbia spotted frog, and a minor beneficial impact to WCT.

Conclusion: Alternative 3 would have direct, long- term, minor adverse impacts to YCT through removal using piscicides. Direct, short- and long- term, minor to moderate adverse impacts may occur to boreal toad and Columbia spotted frog from piscicides; however not introducing genetically pure WCT into High Lake may have a direct, long- term, minor beneficial impact to boreal toad and Columbia spotted frog. A direct, long- term, minor beneficial impact to WCT is anticipated from reintroducing them into the EFSC. Negligible to minor adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to a state Species of Concern.

Wilderness

Methodology

The NPS requires that park units apply a minimum requirement analysis (MRA) in management decisions affecting wilderness. The attached MRA (Appendix B) describes the minimum tools necessary to accomplish the proposed project and mitigation measures needed to minimize impacts to wilderness and backcountry visitors.

Although difficult to measure, wilderness character consists of multiple components, including a state of naturalness and an "untrammeled" state, as well as conditions for solitude, primitive and unconfined experiences, personal challenge, self- sufficiency, and an escape from the reminders of modern society. As well as a state, wilderness character denotes an intention and a commitment to the spirit of an intangible.

Naturalness in wilderness refers to the area being influenced primarily by the forces of nature rather than human efforts to manipulate, control or direct attempts to provide particular benefits. On a species level, naturalness considers the numbers, populations, cycles, and interactions of individual species in a self- willed manner. Relevant human influences on naturalness may be direct or indirect, and may result from actions taken within or outside of the wilderness.

Wilderness experiences for visitors are largely self- directed and will be individual, based on one's state of mind. However, wilderness managers have an obligation to provide a setting in which people may find opportunities for solitude, primitive and unconfined experiences, risk, challenge, and self- sufficiency. Important components which can be managed include privacy, isolation, freedom from constraints, and an absence of the reminders of modern society and human noise and distractions. Auditory or visible signs of human instrusion, including generators, aircraft over- flights for research and wildland fire management, and mechanized maintenance equipment can also detract from the naturalness of wilderness. The threshold of change for intensity (i.e., degree) of impacts to wilderness are defined below.

Wilderness Intensity Thresholds	Definition
Negligible	Impacts would be very slight, and if detectable, would be highly localized. Visitors would not likely be aware of them.
Minor	Impacts would be detectable but would be relatively localized. Visitors would likely be aware of the impacts and their wilderness experience would be somewhat diminished.
Moderate	Impacts would be detectable and not localized, affecting a moderate area of the watershed. Visitors would be aware of the impacts and their wilderness experience would be moderately diminished.
Major	Impacts would be highly detectable, frequent, and affect a large proportion of the watershed or extend beyond the watershed. Visitors would be readily aware of the impacts and their wilderness experience would be significantly diminished.

Impacts of Alternative 1 on Wilderness

Impact Analysis: There would be no direct or indirect impacts to wilderness under Alternative 1 because no project would be implemented.

Cumulative Impact Analysis: Ongoing administrative flights (research and wildland fire management) and occasional use of chainsaws to maintain backcountry trails would continue to occur in the EFSC watershed, resulting in short- term, negligible adverse impacts. Past and ongoing recreational use of backcountry trails and campsites, including the use of stock, contribute to long- term negligible adverse impacts to vegetation from trampling and erosion. Park staff strives to rehabilitate vegetation and soils when needed. Backcountry visitation to the watershed could increase slightly over the next several decades as a result of population growth in Gallatin County, Montana, and elsewhere; however, impacts to wilderness beyond a minor adverse intensity are not anticipated. When added to the other past, present, and reasonably foreseeable future actions within the EFSC watershed, Alternative 2 would not add direct or indirect impacts.

Conclusion: Alternative 1 would result in no direct or indirect impacts. There would be negligible to minor adverse cumulative impacts to wilderness from administrative and recreational use. Because there would be no unacceptable impacts, there would be no impairment to wilderness.

Impacts of Alternative 2 on Wilderness

Impact Analysis: During the years chemical treatment occurs, a purple color and oily sheen would be visible on EFSC and/or High Lake for an estimated 40 days each year from the use of the proposed piscicides and neutralization agent. Noise from helicopters and outboard motors would occur during late summer and early fall would occur at High Lake. The neutralization stations below High Lake and in the EFSC would be operated 24 hours a day, requiring lanterns and one or two floodlights at night during this period. One or two generators may be used to power floodlights and mechanical pumps at the neutralization stations. Crews with personal gear and light equipment would hike in or be transported by stock.

Although the fish barrier would be constructed from nearby native logs and rocks, non- natural rebar, wire mesh, and mortar would be needed to ensure barrier stability within the streambank and the stream. The fish barrier would be constructed to minimize obvious non- natural materials (including the in- stream splashpad below the barrier) and would not be directly visible from the trail; however, up close, it would be noticeable as a non- natural structure. Noise from chainsaws used in the construction of the fish barrier could be heard from the East Fork Specimen Creek trail and at campsites that is near the proposed barrier site. Chainsaws would be used minimally to cut large diameter logs and to cut stumps flush with the surface of the ground to reduce any visual impacts.

Following nonnative and hybridized trout removal, a combination of pack stock and helicopters would be used to bring genetically pure WCT to High Lake and the EFSC. One or two helicopter flights and landings would occur each year over am approximately six- year period. Resource advisors would be present to educate backcountry visitors during the project. Signs would be placed at trailheads and trail junctions to inform the public about the project and its impacts. Any resource impacts to vegetation and soils would be rehabilitated under the guidance of NPS resource advisors.

Alternative 2 would result in direct, short- term, negligible to minor adverse impacts to wilderness character, naturalness and wilderness experience from the use of piscicides, noise, (helicopters, chainsaws, stock, crew operations), and visual intrusion (purple color and oily sheen to water), and crew operations, and a direct, long- term, minor to moderate adverse impact to naturalness and wilderness experience from the construction and permanent use of the in- stream fish barrier.

Cumulative Impact Analysis: Ongoing administrative flights (research and wildland fire management) and occasional use of chainsaws to maintain backcountry trails would continue to occur in the EFSC watershed, resulting in short- term, negligible adverse impacts. Past and ongoing recreational use of backcountry trails and campsites, including the use of stock, contribute to long- term negligible adverse impacts to vegetation from trampling and erosion. Park staff strives to rehabilitate vegetation and soils when needed. Backcountry visitation to the watershed could increase slightly over the next several decades as a result of population growth in Gallatin County, Montana, and elsewhere; however, impacts to wilderness beyond a minor adverse intensity are not anticipated. When added to the other past, present, and reasonably foreseeable future actions within the EFSC watershed, Alternative 2 would add direct, short-term, negligible to minor adverse impacts from project operations and a long- term, minor to moderate adverse impact from the permanent fish barrier.

Conclusion: Alternative 2 would have direct, short- term, negligible to minor adverse impacts to wilderness from the use of piscicides, noise, visual intrusion, and crew operations. Permanent use of the in- stream fish barrier would result in a long- term, minor to moderate adverse impact. There would be minor to moderate adverse cumulative impacts. Because there would be no unacceptable impacts, there would be no impairment to wilderness.

Impacts of Alternative 3 on Wilderness

Impact Analysis: The direct and indirect impacts of Alternative 3 to wilderness would be very similar to those of Alternative 2, except there would be a slight reduction in adverse impacts from project operations (helicopter noise and crew operations) because WCT would not be introduced into High Lake.

Alternative 3 would result in direct, short- term, negligible to minor adverse impacts to wilderness character, naturalness and wilderness experience from the use of piscicides, noise, (helicopters, chainsaws, stock, crew operations), and visual intrusion (purple color and oily sheen to water and crew operations), and a long- term, minor to moderate adverse impact to naturalness and wilderness experience from the construction and permanent use of the in-stream fish barrier.

Cumulative Impact Analysis: Ongoing administrative flights (research and wildland fire management) and occasional use of chainsaws to maintain backcountry trails would continue to occur in the EFSC watershed, resulting in short- term, negligible adverse impacts. Past and ongoing recreational use of backcountry trails and campsites, including the use of stock, contribute to long- term negligible adverse impacts to vegetation from trampling and erosion. Park staff strives to rehabilitate vegetation and soils when needed. Backcountry visitation to the watershed could increase slightly over the next several decades as a result of population growth in Gallatin County, Montana, and elsewhere; however, impacts to wilderness beyond a minor adverse intensity are not anticipated. When added to the other past, present, and reasonably foreseeable future actions within the EFSC watershed, Alternative 3 would add direct, short-term, negligible to minor adverse impacts from project operations and a long- term, minor to moderate adverse impact from the permanent fish barrier.

Conclusion: Alternative 3 would result in direct, short- term, negligible to minor adverse impacts to wilderness from the use of piscicides, noise, visual impacts, and crew operations. Permanent use of the in- stream fish barrier would result in a long- term, minor to moderate adverse impact. There would be minor to moderate adverse cumulative impacts. Because there would be no unacceptable impacts, there would be no impairment to wilderness.

Socioeconomic Resources

Methodology

Impacts to commercial (backcountry) outfitters were analyzed based on routine permit and other data collected by the park. The thresholds of change for intensity (i.e., degree) of impacts to socioeconomic resources are defined below.

Socioeconomic Resources Intensity Thresholds	Definition
Negligible	Commercial outfitters would not be impacted or would be able to re- route their trips to other areas of the park.
Minor	A small number of commercial backcountry outfitters would be temporarily impacted by having to cancel a trip and their overall business would be slightly impacted.
Moderate	Several commercial outfitters would not be able to reroute their trips in the park and would experience a financial loss that would moderately impact their overall business.
Major	Many commercial outfitters would experience a financial loss that would significantly impact their overall business.

Impacts of Alternative 1 on Socioeconomic Resources

Impact Analysis: There would be no direct or indirect impacts to commercial outfitters because no project would be implemented.

Cumulative Impact Analysis: Past and present actions in the EFSC watershed are not known to have impacted the 16 commercial outfitters who conduct trips in the EFSC watershed. Future impacts to commercial outfitters could result if visitation were to increase to the watershed to the point of limiting the availability of backcountry campsites, resulting in an indirect, short-term minor adverse impact. When added to the other past, present, and reasonably foreseeable future actions, Alternative 1 would not add direct or indirect impacts.

Conclusion: Alternative 1 would result in no direct or indirect impacts to commercial outfitters. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to commercial backcountry outfitters.

Impacts of Alternative 2 on Socioeconomic Resources

Impact Analysis: Three to four campsites in the EFSC and High Lake would be restricted from commercial use during piscicide treatments and barrier construction for use by project personnel for three years. Most or all of the 16 commercial outfitters who have used the EFSC watershed for at least one annual trip would be able to conduct trips to other available campsites in the watershed or to nearby watersheds. Commercial backcountry and fishing opportunities would still exist in North Fork Specimen Creek and nearby watersheds during project implementation.

There would be a direct, short- term, minor adverse impact due to temporary trail and backcountry campsite closures during chemical treatment of waters and use of some backcountry campsites by work crews. The project would occur in August and September, which are months of high use by commercial outfitters in the EFSC watershed.

Cumulative Impact Analysis: Past and present actions in the EFSC watershed are not known to have impacted the 16 commercial outfitters who conduct trips in the EFSC watershed. Future impacts to commercial outfitters could result if visitation were to increase to the watershed to the point of limiting the availability of backcountry campsites, resulting in an indirect, short-term minor adverse impact. When added to the other past, present, and reasonably foreseeable future actions, Alternative 2 would add direct, short- term, negligible to minor adverse impacts to commercial outfitters.

Conclusion: Alternative 2 would result in direct, short- term, negligible to minor adverse impacts to commercial outfitters from temporary restrictions on trail and campsite use. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to socioeconomic resources.

Impacts of Alternative 3 on Socioeconomic Resources

Impact Analysis: Impacts under Alternative 3 would be very similar to Alternative 2. Trail and campsite restrictions would be necessary for piscicide applications and to provide campsites for work crews. However, under Alternative 3, there would be a slight reduction in backcountry campsite closures at High Lake because WCT would not be introduced there after YCT were removed.

Commercial backcountry and fishing opportunities would still exist in North Fork Specimen Creek and nearby watersheds during fish removal operations. There would be a direct, short-term, minor, adverse impact to commercial outfitters due to temporary trail and backcountry campsite closures during chemical treatment of waters and use of some backcountry campsites by work crews. The project would occur in August and September, which are months of high use by commercial outfitters.

High Lake has supported a viable YCT fishery for over 70 years, attracting anglers to this headwater lake. Under Alternative 3, introduced YCT would be removed from High Lake and genetically pure WCT would not be introduced into High Lake. Not having a fishery in this lake could result in a temporary loss of a backcountry trip for one or more outfitters, resulting in a minor adverse impact.

Cumulative Impact Analysis: Past and present actions in the EFSC watershed are not known to have impacted the 16 commercial outfitters who conduct trips in the EFSC watershed. Future impacts to commercial outfitters could result if visitation were to increase to the watershed to the point of limiting the availability of backcountry campsites, resulting in an indirect, short-term minor adverse impact. When added to the other past, present, and reasonably foreseeable future actions, Alternative 3 would add direct, short- term, minor adverse impacts to commercial outfitters.

Conclusion: Alternative 3 would result in direct, short- term, minor adverse impacts to commercial outfitters from temporary restrictions on trail and campsite use and from the lack of a fishery in High Lake as a result in not introducing genetically pure WCT into High Lake. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to socioeconomic resources.

Visitor Use Including Recreation and Angling

Methodology

Impacts to backcountry and day use visitors and anglers were analyzed based on routine permit and other data collected by the park. Approximately 114 anglers that use the Specimen Creek watershed (both East and North Forks) each summer season.

The threshold of change for intensity (i.e., degree) of impacts to visitor use including recreation and angling are defined below.

Visitor Use Intensity Thresholds	Definition
Negligible	Impacts would be slight, and if detectable, would be very short- term and highly localized. Visitors would not likely be aware of them.
Minor	Impacts would be detectable but short- term and localized. Visitors would likely be aware of impacts associated with implementation of the alternative but recreational use and/or experience would not be diminished.
Moderate	Impacts would be detectable and could be short or long- term but would not be localized. Visitors would be aware of impacts associated with implementation of the alternative and visitor use and/or experience would be diminished somewhat.
Major	Impacts would be detectable, frequent, long- term and cover a large area. Visitors would be readily aware of impacts associated with implementation of the alternative and visitor use and/or experience would be substantially diminished.

Impacts of Alternative 1 on Visitor Use Including Recreation and Angling

Impact Analysis: Under Alternative 1, genetically pure WCT would not be restored to the EFSC watershed and the fishery would continue to lose its uniqueness. There would be along- term, indirect, minor adverse impact to visitors and anglers who want to have genetically pure WCT restored in the EFSC watershed and the existing degraded fishery would become progressively less appealing to these visitors. Opportunities for catching or observing indigenous species would decrease. The High Lake fishery for introduced YCT, however, would persist into the foreseeable future, as it has since the subspecies was introduced in 1937.

Cumulative Impact Analysis: Past, present and future impacts to visitor use in the EFSC watershed from recreational and stock use, park maintenance activities, and administrative flights contribute to long- term, negligible adverse cumulative impacts. When added to the other past, present, and reasonably foreseeable actions, Alternative 1 would add long- term, minor adverse impacts to those visitors and anglers who want to have genetically pure WCT restored.

Conclusion: Alternative 1 would result in an indirect, long- term minor adverse impact to visitor use. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to visitor use including recreation and angling.

Impacts of Alternative 2 on Visitor Use Including Recreation and Angling

Impact Analysis: Direct, short- term, minor adverse impacts would occur to anglers because fishing opportunities would be temporarily closed in EFSC and High Lake during the 3- 6 years when fish are removed and until genetically pure WCT are restored in these waters. Fishing opportunities would still exist in North Fork Specimen Creek and nearby watersheds during fish removal. There would be a direct, short- term, minor adverse impact on recreational backcountry use due to temporary trail and backcountry closures during chemical treatment of waters and use of some backcountry campsites by work crews during periods of high use by visitors. There would be direct, short- term, minor, adverse impacts to visitors from project operations including noise (helicopters, chainsaws, and generators) and night lighting.

Indirect, long- term negligible to minor adverse impacts to visitors would occur after restoration of genetically pure WCT because fishing opportunities in the EFSC watershed would be limited to the relatively small cutthroat trout that can be supported by local stream productivity. Overall, the abundance and size of fish available to anglers would depend entirely on the inherent productivity of the watershed upstream of the fish barrier, and not on the characteristics of any fish populations below the fish barrier. Opportunities for catching or observing indigenous species would increase. There would be an indirect, long- term, moderate beneficial impact to visitors and anglers from restoration of genetically pure WCT in the EFSC and High Lake.

Cumulative Impact Analysis: Past, present and future impacts to visitor use in the EFSC watershed from recreational and stock use, park maintenance activities, and administrative flights contribute to long- term, negligible adverse cumulative impacts. When added to the other past, present, and reasonably foreseeable actions, Alternative 2 would add short- and long- term, negligible to minor adverse impacts to visitors and anglers, and an indirect, long- term, moderate beneficial impact from restoration of genetically pure WCT.

Conclusion: Alternative 2 would result in direct and indirect, short- and long- term negligible to minor adverse impacts to visitors and anglers from project operations and some restrictions on access. A long- term, moderate beneficial impact is expected from the restoration of genetically pure WCT to project waters. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to visitors or anglers.

Impacts of Alternative 3 on Visitor Use Including Recreation and Angling

Direct, short- term, minor adverse impacts would occur to anglers because fishing opportunities would be temporarily closed in EFSC and High Lake during the 3- 6 years when fish are removed and until genetically pure WCT are restored in these waters. Fishing opportunities would still exist in North Fork Specimen Creek and nearby watersheds during fish removal. There would be a direct, short- term, minor adverse impact on recreational backcountry use due to temporary trail and backcountry closures during chemical treatment of waters and use of some backcountry campsites by work crews during periods of high use by visitors. There would be direct, short- term, minor adverse impacts to visitors from project operations including noise (helicopters, chainsaws, and generators) and night lighting.

Indirect, long- term negligible to minor adverse impacts to visitors would occur after restoration of genetically pure WCT because fishing opportunities in the EFSC watershed would be limited to the relatively small cutthroat trout that can be supported by local stream productivity. Overall, the abundance and size of fish available to anglers would depend entirely on the inherent productivity of the watershed upstream of the fish barrier, and not on the characteristics of any fish populations below the fish barrier. Opportunities for catching or observing indigenous species would increase. There would be an indirect, long- term, minor beneficial impact to visitors and anglers from restoration of genetically pure WCT in the EFSC only.

Under Alternative 3, introduced YCT would be removed from High Lake and genetically pure WCT would not be introduced into High Lake, maintaining the lake in its historically fishless condition. This would limit angling opportunities for genetically pure WCT to the EFSC, resulting in indirect, long- term moderate adverse impacts to some backcountry anglers. Not introducing WCT into High Lake, however, would be a direct, long- term minor beneficial impact to visitors and angler.

Cumulative Impact Analysis: Past, present and future impacts to visitor use in the EFSC watershed from recreational and stock use, park maintenance activities, and administrative flights contribute to long- term, negligible adverse cumulative impacts. When added to the other past, present, and reasonably foreseeable actions, Alternative 3 would add short- and long-term, negligible to moderate adverse impacts to visitors and anglers by not providing a fishery in High Lake, and an indirect, long- term, minor beneficial impact to those visitors and anglers who wish to have a headwater lake returned to its natural state.

Conclusion: Alternative 3 would result in direct and indirect, short- and long- term negligible to minor adverse impacts to visitors and anglers, and an indirect, long- term, minor beneficial impact to some visitors. Negligible adverse cumulative impacts would occur. Because there would be no unacceptable impacts, there would be no impairment to visitor use.

CONSULTATION AND COORDINATION

SCOPING

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an environmental assessment. Yellowstone conducted both internal scoping with appropriate NPS resource specialists and external scoping with the public and interested parties. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, and determined the likely issues and impact topics.

Public scoping to identify issues and concerns began on October 26, 2005, with a press release, mailing to interested parties, and posting of a scoping newsletter on the NPS Planning, Environment and Public Scoping (PEPC) website. Two public meetings were held during November 2005 in Bozeman and West Yellowstone, Montana, to solicit comments on the proposed issues, alternatives, and impact topics for the EA. Fifteen people attended the Bozeman public meeting and 1 person attended the West Yellowstone public meeting. A total of sixteen written comment letters concerning the project were received through PEPC, letters, and e- mails from individuals, state government agencies, businesses, and nonprofit organizations. Public scoping ended on November 30, 2005.

Public comments primarily concerned use of public angling and/or electroschocking to remove nonnative and hybridized trout, removing the YCT fishery in High Lake and then not introducing WCT into High Lake, the use of High Lake as a WCT refugia, and impacts to non-target organisms, and the value of High Lake as a fishless lake. Scoping comments were used during the formulation of alternatives and impact topics analyzed in the EA.

CONSULTATION WITH ASSOCIATED TRIBES

A letter and project newsletter were mailed to Yellowstone's 26 associated tribes and 47 other potentially interested tribes to solicit concerns and comments for the proposed project. The park received a comment letter from the Comanche Tribe, requesting that the park keep them informed of project progress, including further archeological reports and findings for the new project area, and to immediately cease work and notify them in the event that human remains or archeological items are discovered. The park will send a copy of the draft EA to the Comanche Tribe. The park will notify the 73 tribes of the availability of the draft EA and will forward a copy to any tribe requesting it.

NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION

The park will submit the draft EA to the Montana State Historic Preservation for their review and comment for compliance with Section 106 Consultation under the National Historic Preservation Act.

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

Prior to implementation of the project, the park will complete an informal Section 7 consultation under the Endangered Species Act for "not likely to adversely affect" determinations for the threatened grizzly bear, gray wolf, Canada lynx, and bald eagle.

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APPENDIX A: SAFETY AND HEALTH PLAN

SAFETY AND HEALTH PLAN
CHEMICAL SPILL PROCEDURES
FOR
RESTORATION OF WESTSLOPE CUTTHROAT TROUT IN EAST FORK SPECIMEN CREEK WATERSHED

Brandon Gauthier, Yellowstone National Park Safety and Health Manager

Britton Gray, Yellowstone National Park Structural Fire Chief

Todd Koel, Supervisory Fisheries Biologist and Project Leader

May 1, 2006

1.0 INTRODUCTION

This document describes the Health & Safety (H&S) protocols developed for the Restoration of Westslope Cutthroat Trout in the East Fork Specimen Creek Watershed project. This plan was developed to protect on- site personnel, visitors, and the public from health and safety hazards. The procedures and guidelines contained herein are based on the most up- to- date information available at the time of drafting this document. Specific sections of this plan will be changed or revised when additional information is received or when conditions at the site change. Any changes or revisions to this plan will be by a written amendment which will become part of this plan as Appendix A.

1.1 SITE BACKGROUND

The project site is located in the extreme northwest corner of the park (Attachment 1). The piscicides antimycin and/or rotenone will be used to remove nonnative and hybridized fish. Bioassays using antimycin are planned for use in East Fork Specimen Creek in 2006. The piscicide rotenone will be used to treat High Lake over a two- year period (planned for 2006 and 2007). Antimycin and rotenone will be used to treat the East Fork Specimen Creek over a two-year period (planned for 2007 and 2008). The detoxifying agent, Potassium Permanganate ($KMnO_4$), will be used to neutralize the bioassays and piscicide treatments downstream of application for all bioassays and piscicide treatments. Material Safety Data Sheets for the three chemicals will be available for project personnel and will be followed.

1.2 SITE SAFETY PLAN ACKNOWLEDGMENT & ACCEPTANCE

The park's Safety and Health Manager, Structural Fire Chief, and Project Leader will sign this plan (cover page) and will be responsible for informing all individuals assigned to or visiting the site of the contents of this plan. By signing this plan, these individuals recognize the health and safety hazards associated with this particular project and the protocols needed to minimize exposure to such hazards.

1.3 TRAINING REQUIREMENTS

All personnel assigned to the site must have completed basic personal protective equipment training and hazard communication training at a minimum. If a spill of any of these three chemicals were to occur, employees involved must have received training per 29 CFR 1910.120. Documentation of OSHA training is required prior to personnel being permitted to work on-site.

1.4 SITE SAFETY AND HEALTH MEETINGS

A starter health and safety meeting will be held on the first day of work at the site and prior to the commencement of any work activities. Additional health and safety meeting will be held on a regular scheduled basis throughout the duration of the project. These meetings will be held on a weekly basis. The meetings should be formatted to inform personnel of changing site conditions, to ensure that personal protective equipment (PPE) is being used properly, and to address any new H&S concerns.

2.0 CHEMICAL HAZARDS

Potassium Permanganate ($KMnO_4$)	Dark purple solid. ***Danger!*** Strong Oxidizer. Contact with other material may cause a fire. May cause kidney damage. May be harmful if swallowed. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. Causes severe eye and skin irritation with possible burns. Reproductively active.
Antimycin A	Toxic by inhalation, in contact with skin and if swallowed. May be fatal if inhaled, swallowed, or absorbed through skin. Do not breathe dust.
Rotenone (both powder and liquid forms)	Fatal if inhaled. May be fatal if swallowed. Causes substantial, but temporary, eye injury. Cases skin irritation. Do not breathe spray mist. Do not get in eyes, on skin, or on clothing. Wear goggles or safety glasses. This product is an orange, viscous liquid with slight petroleum odor.

3.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Minimum
- Eye protection, skin protection to prevent exposure, and clothing to prevent exposure must be used when handling any of the chemicals listed above.
- $KMnO_4$: NIOSH (National Institute for Occupational Safety and Health) dust mask for handling solids.
- Rotenone: Respirator for organic vapors, with a pesticide pre- filter.

Emergency
Tyvex suit, booties, full face respirator, and gloves are the minimum PPE which must be worn if emergency clean up of the chemicals is to take place.

4.0 GENERAL FIELD SAFETY AND HEALTH STANDARDS

1. Eating, drinking, and use of tobacco is not permitted on the jobsite.
2. No one is to perform field work with these chemicals alone. Maintain visual, voice, or radio communication at all times.
3. Hands and face must be thoroughly washed upon leaving the work area.
4. All materials and equipment which are used with the chemicals must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment which is contaminated must be properly packaged in plastic sacks and stored on- site unit disposal arrangements are made. Contact Mike McCoy in the plumbing shop (307- 344- 2333) to assure proper disposal of the articles.

5.0 EMERGENCY RESPONSE PLAN

It is essential that all site personnel be prepared in the event of a health and safety emergency. The following outlines the general procedures.

The project manager has the primary responsibility for responding to and correcting emergency situations. The onsite manager will:

- Take appropriate measures to protect personnel including withdrawal from the exclusion zone, total evacuation and securing of the site, or upgrading or downgrading the level of PPE.
- Ensure that appropriate decontamination treatment or testing for exposure or injured personnel is obtained.
- Take appropriate measures to protect the public and the environment.
- Contact the park dispatch which will in turn contact the Fire Chief and Safety Officer to coordinate an appropriate response.

SITE LOCATION: East Fork Specimen Creek, its tributaries and High Lake.

EMERGENCY CONTACTS:

Fire:	911 or Radio 700
Police:	911 or Radio 700
Ambulance:	911 or Radio 700
Hospital:	Bozeman Deaconess 406- 585- 5000 Livingston Healthcare 406- 222- 3541
Poison Control Center:	1- 800- 392- 9111
National Response Center:	1- 800- 424- 8802
Center for Disease Control:	1- 404- 488- 4100
AT&F	1- 800- 424- 9555
Chemtrec:	1- 800- 424- 9300
3E Company	1- 800- 451- 5346

APPENDIX B. MINIMUM REQUIREMENT ANALYSIS

MINIMUM REQUIREMENT ANALYSIS WORKSHEET
YELLOWSTONE NATIONAL PARK
YELL 6/2003)

PROPOSED ACTION: Westslope Cuthroat Restoration in Specimen Cr. **DATE:** March. 15, 2006

LEAD PERSON(S): Todd Koel (344-2281) WORK YNP Fisheries and Aquatic Sciences

PART A: Minimum Requirement *(should the action be done in proposed wilderness)*

1 IS ACTION AN EMERGENCY?

YES → ACT ACCORDING TO APPROVED MINIMUM TOOL
NO ↓

Answer: ☐ Yes ☒ **No**
Explain: Action is not an immediate threat to human life safety, or natural or cultural resources.

2 DOES ACTION CONFLICT WITH PLANNED WILDERNESS GOALS, OR FUTURE DESIRED CONDITIONS?

YES → DO NOT DO IT
NO ↓

Answer: Yes ☒ **No**
Explain: Under The Wilderness Act and NPS RM41 Guidelines, this action must conform to the "Minimum Tool Concept." There will be short-term impacts to wilderness in the northwest portion of the park. These impacts will include noise/visuals from helicopters, motor boat engines, generators, and lights. There will be negligible to minor resource damage from project operations.

3 IS ACTION PRE-APPROVED BY THE WILDERNESS AND OR OTHER PARK MANAGEMENT

YES → DO ACCORDING TO APPROVED CRITERIA
NO ↓

Answer: ☐ Yes ☒ **No**
Explain: There is no approved YNP Backcountry/Wilderness Plan to date.

4 CAN ACTION BE ACCOMPLISHED THROUGH A LESS INTRUSIVE ACTION SHOULD BE TRIED FIRST?

YES → DO IT
NO ↓

Answer: ☐ Yes ☒ **No**
Explain: The most effective way to remove nonnative/hybridized fish is by the use of approved piscicides (fish toxins). The project will fail if all nonnative/hybridized fish are not removed prior to stocking with westslope cutthroat trout (WCT). Specimen Creek provides our best opportunity to restore native WCT and create a lake population as a secure refugia. There is no other less intrusive action that can be used.

5 CAN ACTION BE ACCOMPLISHED OUTSIDE OF PROPOSED WILDERNESS ACHIEVE ITS OBJECTIVES?

YES → DO IT THERE
NO → DO PART B

Answer: ☐ Yes ☒ **No**
Explain: All known restoration sites for WCT occur within YNP's recommended wilderness.

PART B: Minimum Tool *(how the action should be done in proposed wilderness)*

6	DESCRIBE, IN DETAIL, ALTERNATIVE TO ACCOMPLISH THE PROPOSED (These may include, primitive skill/tool, motorized, and/or combination alternatives) (Use addition pages if necessary)		* Minimum questions to answer for each What is proposed? Where will the action take place? When will the action take place? What design and standards will apply? What methods and techniques will be used? How long will it take to complete the action? Why is it being proposed in this manner? What mitigation will take place to minimize
	GO TO NEXT STEP		
7	EVALUATE WHICH ALTERNATIVE HAVE THE LEAST OVERALL IMPACT WILDERNESS RESOURCES, AND VISITOR EXPERIENCE **		** Minimum criteria used to evaluate each Biophysical effects Social/Recreational/Experiential effects Societal/Political effects Health/Safety concerns Economical/Timing considerations
	GO TO NEXT STEP		
8	SELECT AN APPROPRIATE, PREFERRED ALTERNATIVE	IF → REQUIRED	**9** ATTACH TO APPROPRIATE PROJECT PROPOSAL/CLEARANCE FORM FOR AND APPROVAL/DISAPPROVAL

Alternative 1 (i.e., preferred alternative): High Lake would be treated with approved piscicides by certified personnel during 2006 and 2007. East Fork of Specimen Creek would be treated with approved piscicides by certified personnel in 2007 and 2008 and for bioassays in 2006. There would be a visual effect of purple color/oily sheen on High Lake and in Specimen Creek from the detoxification process. We would use helicopters to transport heavy equipment to/from base of operations at High Lake. There will be 2-4 helicopter landings per year in 2006 and 2007. Two rafts outfitted with outboard motors would be used to apply and mix the piscicide within the lake. Generators would be used to power lights and mechanical pumps at detoxification stations located on streams. In 2006, a permanent structure (fish barrier) made from logs, rocks, rebar and mortar would be constructed on the East Fork of Specimen Creek, immediately upstream for the confluence with the North Fork. Chainsaws would be used during this construction. One to three (annually) helicopters would be used to stock genetically pure westslope cutthroat trout in subsequent years after the nonnative were removed in High Lake and the East Fork of Specimen Creek.

Alternative 2 (i.e., reduced mechanization): Same as Alternative 1 with the following exceptions: No helicopters would be used to transport equipment, and, instead, all equipment would be transported as possible using pack stock. Outboard motors would be used on High Lake to mix piscicide. No generators would be used. Chainsaws would not be used for barrier construction. High Lake would be treated with approved piscicides by certified personnel during 2006 and 2007. East Fork of Specimen Creek would be treated with approved piscicides by certified personnel in 2007 and 2008 and for bioassays in 2006. There would also be a visual effect of purple color/oily sheen on lake and in Specimen Creek from the detoxification process. Pack stock would be used to stock genetically pure westslope cutthroat trout in subsequent years after the nonnatives were removed in High Lake and the East Fork of Specimen Creek.

Alternative 3 (i.e., no action): No mechanization.

List preferred alternative and give justification: Alternative 1 is the preferred alternative. Allowing the use of a small amount of mechanization would greatly reduce (by a period of weeks) the amount of time that the watershed and visitors would be impacted by this project each season—. This project would be accomplished using only the absolute minimum amount of mechanization. In 2006 and 2007, 2-4 helicopter landings would be used to haul heavy equipment that is too heavy or bulky to safely transport with stock. Crews with personal gear and light equipment will hike in or be transported by stock. Piscicides are required and would be used to ensure complete removal of non-native species. The outboard motors and rafts are necessary to effectively distribute the piscicides on High Lake. Not using the rafts and outboards could easily result in a failure of the project, through incomplete mixing of piscicide and survival of the nonnative fish. Lights, generators, and mechanical pumps are required to safely and effectively operate the detoxification station, which must be staffed on a 24 hour basis. We will use lanterns and battery powered pumps as much as possible to minimize generator use. The fish barrier will be constructed using mostly native materials and hand tools. Chainsaws (multiple) will be used minimally to cut large diameter logs used in the barrier and to cut stumps flush with the surface of the ground to reduce any visual impacts. A combination of pack stock and helicopters would be used to stock genetically pure westslope cutthroat trout in subsequent years after the non-native species were removed in High Lake and the East Fork of Specimen Creek based on distance to stocking location, temperature, and ability to best protect these critical westslope for successful stocking. Resource advisors will be present to educate backcountry visitors during the project. Signs will be placed at trailheads and trail junctions to inform the public about the project and its impacts. Any resource impacts will be rehabbed under resource advisors.

Recommended: RM&VP: **YCR:** **Maint:**

Chief Ranger Approval: