

**ENVIRONMENTAL ASSESSMENT  
SUN CREEK BULL TROUT RESTORATION  
CRATER LAKE NATIONAL PARK**

April 17, 1992

National Park Service  
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**ABSTRACT:** This environmental Assessment evaluates (4) alternatives regarding the restoration of the native fishery of Lost and Sun Creeks, both headwater streams located in the southern portion of Crater Lake National Park. This project involves the construction of two in-stream fish barriers and the removal of non-native trout, with approved chemicals and/or electrofishing techniques, to ensure the perpetuation of a remnant population of an endangered species. The "no action" alternative is described. The National Park Service Preferred Plan is identified.

## I. PURPOSE OF AND NEED FOR ACTION

### A. INTRODUCTION

The National Park Service (NPS) is proposing the removal of non-native fish from Lost Creek (an originally fishless stream) and removal of non-native fish from sections of Sun Creek which hosts a remnant population of bull trout (*Salvelinus confluentus*). The construction of two in-stream fish barriers within Sun Creek is also proposed. Each of these creeks are located within Crater Lake National Park, which is administered by the National Park Service, U.S. Department of the Interior (figure 1).

Bull trout have been listed as a category two species (candidate species under the Endangered Species Act) by the U.S. Fish and Wildlife Service (USFWS) and listed as a sensitive species by the State of Oregon. The Oregon Chapter of the American Fisheries Society is petitioning the USFWS to consider bull trout for listing as threatened in the State of Oregon.

Prior to early introductions of non-native salmonids, bull trout were probably the only fish species present in Sun Creek, a high mountain second order stream. NPS and Oregon Department of Fish and Wildlife stocking records indicate repeated stocking of rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*) in Sun Creek between 1928 and 1971. Later introductions occurred downstream from the park boundary. A parkwide survey conducted in 1947 by Orthelo Wallis found bull trout, rainbow trout and brook trout in Sun Creek.

A survey of Sun Creek was initiated in the summer of 1989 to investigate the distribution and abundance of fish relative to habitat characteristics. The creek was surveyed from its headwaters to the park boundary. Bull trout, brook trout and bull trout/brook trout hybrids were collected. Bull trout were restricted to a 1.2 mile reach of stream (figure 2). Total abundance of adult bull trout was estimated at 130 fish. Viability of such a small population is in question. Habitat utilization by the two species was very similar. Competition and hybridization with brook trout have probably reduced the distribution of bull trout in Sun Creek. The present, low population density of bull trout is alarming as it suggests local extinction could occur within the next few years.

The goal of the Crater Lake National Park bull trout management program is to remove non-native brook trout and bull trout/brook trout hybrids from Lost and Sun Creeks and to re-establish a self-sustaining population of bull trout within the park. This goal is consistent with the NPS policy of providing the American people with the opportunity to enjoy and benefit from natural environments evolving through natural processes minimally influenced by human action. This includes controlling non-native species wherever such species threaten park resources and interfere with natural processes and the perpetuation of native species (especially those that are endangered, threatened, or otherwise unique). This goal is also consistent with the policy of identifying and promoting the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their

critical habitats, and consistent with the legal requirements of the Endangered Species Act.

During the fall of 1991, Crater Lake National Park convened a "Bull Trout Recovery Team" (Recovery Team) to develop recommendations on how to best achieve these goals. The team consisted of experts in fish ecology and stream restoration from the NPS, USFWS, U.S. Forest Service (USFS), Oregon Department of Fish and Wildlife, Desert Fishes Council, and Oregon State University. The following alternatives are a result of ideas and recommendations presented by the Recovery Team.

#### **B. Scope of Environmental Assessment**

This Environmental Assessment (EA) is not a decision document. It is a document disclosing the environmental consequences of implementing the proposed action and alternatives to that action. A thirty-day public comment period is scheduled before a decision is reached by the NPS.

## II. ALTERNATIVES

### A. Alternative One (No Additional Action)

Under this alternative, no additional action on Sun or Lost Creeks would be carried out.

### B. Alternative Two (Preferred Action)

This alternative follows recommendations provided by the Recovery Team and includes the removal of non-native brook trout and bull trout/brook trout hybrids from Sun and Lost Creeks to enhance spawning success and growing conditions, to reduce or eliminate interspecific competition and hybridization, and to provide optimum habitat for the native bull trout. It also includes the construction of two fish barriers below the bull trout section of Sun Creek (figures 1,2) to prevent brook trout from recolonizing the bull trout habitat. Fish and other stream inhabitants would be able to migrate downstream past the barriers. Based on long term evaluations of program success, repetition of some aspects of this alternative may be required.

Removal of non-native fish would be accomplished through a combination of antimycin treatments and electrofishing. Native bull trout would remain in the stream system during these treatments.

Non-native trout eradication would be accomplished with the use of a piscicide (Antimycin) in the lower reach of Sun Creek (below the bull trout section) (table 1) and the entire length of Lost Creek prior to the spawning season in 1992. Brook trout spawning carries the potential of adding thousands of brook trout eggs into the gravel that would hatch out in 1993. Ideally, this work should be completed prior to mid-August, and by Labor Day at the very latest. All safety measures governing the application of antimycin would be implemented and an Incident Command System would be in place to deal with any potential hazards. Bioassay studies have been completed for determining toxicity levels of antimycin and potassium permanganate in Sun Creek waters and have been incorporated in determining the amount of chemicals to be used (table 1).

Non-native trout would also be removed from Lost Creek. Lost Creek would be temporarily utilized as a refuge for young-of-the-year bull trout electrofished and transplanted from upper Sun Creek, beginning in 1993. Beginning as early as 1995, bull trout from Lost Creek would be reintroduced into Sun Creek to enhance recovery. This refuge would allow for a temporary backup population of bull trout in the event that complete or partial retreatment of Sun Creek is necessary in the future.

This alternative requires the construction of two fish barriers below the bull trout population to ensure that, following non-native trout removal, no additional non-native fish migrate up Sun Creek into bull trout habitat. Past experience by the Recovery Team in California, indicates that two barriers are necessary to ensure the integrity of recovery efforts. In the event that

undesirable fish make it past the lower barrier (through human intervention or structural failure) future eradication may be restricted to between the two barriers without having to involve the entire stream system.

The lower-most barrier would be constructed utilizing one of two methods. The first method would include the use of an articulating backhoe. The articulating backhoe is not a standard tracked or rubber tired backhoe. This machine can crawl in and out of the project site on two large rubber tires and articulating arms. Conventional equipment would require unacceptable earthwork and road construction for stream access. The articulating backhoe is capable of entering stream channels and traversing rough terrain with a minimal amount of disturbance and is capable of moving the required sized logs and rocks. It would be capable of constructing the barrier in five days with a six person crew. The alternative method would consist of a crew of six to ten people using cable and pulley systems to move logs and rocks. This method would require approximately twenty days to complete.

Heavy equipment would not be utilized in construction of the upper-most barrier. Six people would be required for approximately fifteen days to complete its construction. Both of the barriers would be rock gravity structures. They would be constructed of logs which form a base and frame to be filled with a filter cloth and rocks. The logs and rocks would be acquired from the barrier sites. The barriers would, in effect, be similar to natural waterfalls with no water impoundment and would accomplish the task of stopping upstream fish migration.

Electrofishing techniques would be utilized to remove the non-native trout from the section of Sun Creek upstream of the bull trout. The use of chemicals upstream from the bull trout was ruled out to assure there would be no possibility of chemicals adversely affecting this small population. Electrofishing would be undertaken prior to, and during the same general time period as the chemical treatment. This would minimize the likelihood of pretreatment spawning. Electrofishing would be continued annually, beginning in 1992, until the restoration of bull trout and the elimination of non-native trout is complete.

### **C. Alternative Three**

Alternative 3 outlines the use of electrofishing only, above and below the existing bull trout, for the removal of non-native trout from Sun and Lost Creeks. There would be no chemicals used in this alternative. The need for barrier construction would be the same as in alternative 2.

### **D. Alternative Four**

This alternative outlines the complete removal of non-native trout from the entire length of Sun and Lost Creeks within the park with the use of antimycin. Prior to application of the piscicide, all of the bull trout would be removed from Sun Creek and established at an alternate location. Antimycin would then be applied to the entire length of Sun Creek. Bull trout would be

replaced into Sun Creek following recovery of the aquatic system. Possible locations for establishment of temporary "stocking" populations of bull trout include:

- A. Lost Creek: Lost Creek is a small stream inhabited by a relatively high density of non-native, dwarfed, brook trout. In addition, water quality and temperature regimes are similar in Lost and Sun Creeks. This provides evidence that Lost Creek is suitable habitat for the spawning and rearing of bull trout. Lost Creek is geographically isolated from other streams and was naturally fishless. The creek runs subsurface before entering any other creeks. Brook trout would first need to be removed from Lost Creek using antimycin.
- B. Local Hatchery: Initiate a cooperative agreement with a local hatchery to propagate bull trout.
- C. On-site Aeration Tanks: Bull trout could be temporarily held along the stream channel in stream cooled, aerated and filtered tanks until the toxin flushes the system.

The need for barrier construction would be the same as in alternative 2.

### III. AFFECTED ENVIRONMENT

#### A. Location

The proposed project area is located within Crater Lake National Park in northwestern Klamath County, Oregon. The proposed action involves about seven miles Sun Creek and one and one half miles of Lost Creek (entire length). All of the proposed action would occur on NPS lands. Portions of the project area are designated as proposed wilderness.

#### B. Affected Components

1. **Threatened and Endangered Species:** Sun Creek hosts a remnant population of bull trout (*Salvelinus confluentus*). Bull trout have been listed as a category two species (candidate species under the Endangered Species Act) by the USFWS and listed as a sensitive species by the State of Oregon. The Oregon Chapter of the American Fisheries Society is petitioning the USFWS to consider listing bull trout as threatened or endangered in the State of Oregon.

This section of the park contains potential spotted owl habitat, however, no spotted owls are known to occur in the project area.

An aquatic invertebrate study conducted in 1990 found no threatened or endangered representatives in the treatment sites.

2. **Wetlands:** The project would be conducted in a riverine system. Sun Creek is a second order high elevation stream. It increases from a width of less than 3 feet, in Sun Meadow, to a width ranging from 9 to 18 feet, near the park boundary. Sun Creek is incised into a 25,000 year-old glacial valley filled with pumice ash deposits from the climactic eruption of Mount Mazama. Within the park, the Sun Creek basin ranges in elevation from roughly 6,800 to 4,700 feet above sea level.

Lost Creek is a first order high elevation stream. It is located in the southern section of the park at roughly 6,000 feet above sea level. The stream originates at the base of a spring-fed waterfall and soaks into the pumice after about one and one half miles of stream flow.

Based on established criteria for the determination of wetlands, accepted by the NPS, few wetland resources occur within the project area.

3. **Floodplains:** Because of the configuration of the stream channel as described under the section concerning wetlands, few floodplains occur within the project area.

4. **Wilderness:** In 1978, an omnibus bill (HR 12536) was passed in the House of the United States Congress which included provisions for the designation of wilderness inside Crater Lake National Park. The bill



was then referred to the Committee on Energy and Natural Resources. No definitive action has been taken on this bill.

NPS Management Policies states: *"The Park Service will take no action that would diminish the wilderness suitability of an area recommended for wilderness study or for wilderness designation until the legislative process has been completed."*

Portions of the project area fall within this proposed wilderness.

5. **Fisheries:** Fish surveys conducted in 1989, found bull trout, brook trout and bull trout/brook trout hybrids to be present in Sun Creek and brook trout to be present in Lost Creek.

Within the surveyed portion of Sun Creek (the lower 6.8 miles within the park) 2,300 age 1 and greater fish, 4-8 inches in length, were observed. Brook trout made up 93 percent, bull trout 6 percent and hybrids 1 percent of the total. Lost Creek is estimated to contain 290 age 1 and greater brook trout measuring 3-6 inches in length.

6. **Other Wildlife:** Bird species expected to occur in the project site include several species of passerines, ravens and occasional raptors such as red-tailed hawks and goshawks. Mammals that would be expected to occur in the project site include elk, deer, coyotes, black bear, mountain lion, foxes, squirrels and other small rodents. Aquatic macroinvertebrates occurring in the project site include representatives of the following groups: mayflies (Ephemeroptera), caddisflies (Trichoptera), beetles (Coleoptera), and true flies (Diptera).

7. **Cultural Resources:** There are no known cultural resources within the project area, however, additional surveys will be conducted.

8. **Recreation:** Sun Creek is presently closed to angling. Prior to closing, angler use was light. Angler use of Lost Creek is historically light and the fish are dwarfed in size. Other nearby streams are available to anglers.

9. **Vegetation:** The Sun Creek basin is forested with old growth ponderosa pine, mountain hemlock, and shasta red fir. The forest surrounding Lost Creek consists mainly of lodgepole pine. Stream-side vegetation is dominated by mosses and a limited variety of grasses. All work would be conducted within the active stream channel where establishment of vegetation has been limited.

#### IV. ENVIRONMENTAL CONSEQUENCES AND PUBLIC CONCERN

##### A. Alternative One - No Action

1. None of the Following Would be Affected:

Wetlands  
Floodplains  
Wilderness  
Other Wildlife  
Cultural Resources  
Recreation  
Vegetation

2. **Threatened and Endangered Species:** This alternative would most certainly result in the eventual elimination of bull trout from Sun Creek. The non-native brook trout would persist. This occurrence would mean a further reduction in the genetically isolated Klamath Basin bull trout population which is a category 2 species and under consideration as a federally listed Threatened species. Under this alternative the NPS would not be meeting its responsibilities as required under the Endangered Species Act.

Spotted owls would not be affected in any way by this alternative.

3. **Fisheries:** This alternative would allow for the continued hybridization of brook trout and bull trout and the eventual elimination of bull trout in Sun Creek.

No monetary expenses would be associated with this alternative.

##### B. Alternative Two - Construction of Two In-Stream Barriers and Elimination of Brook Trout Through the use of Piscicides and Electrofishing

1. **Threatened and Endangered Species:** Implementation of this alternative would protect a known population of a category 2 species and enhance critical and historic habitat for that species. The resulting effects would be beneficial.

Spotted owls would not be affected in any way by this alternative.

2. **Wetlands:** This alternative would result in minor alterations to the regular stream flow through the installation of barriers. The barriers would be rock gravity structures. They would be constructed of logs that would form a base and frame to be filled with a filter cloth and rocks. This action would essentially raise the stream channel approximately 3 feet at the location of the barrier, tapering for a distance approximately 80 feet up stream. The barriers would be built to withstand a fifty year flood event. They would be similar to natural waterfalls with no water impoundment. The barriers would not adversely affect subsurface flow or sediment deposition. No wetland resources are located within the vicinity of the barriers, therefore, it is determined

that this alternative would have no adverse effect on the wetland resource and would be consistent with Executive Order 11990. No work would commence until all compliance requirements are satisfied under section 404 of the Clean Water Act.

3. **Floodplains:** No floodplains occur within the immediate vicinity of the proposed barriers. No activity outlined in this alternative would adversely affect floodplain resources. This alternative would be consistent with Executive Order 11988.

4. **Wilderness:** NPS Management Policies state that the protection, stabilization and restoration of a native species within a National Park and wilderness area is preferred over the perpetuation of non-native species.

The Wilderness Act generally prohibits motorized equipment in wilderness areas but allows them, when necessary, to complete minimum requirements for administration of the area in accordance with the Act. The use of a motorized vehicle and gas powered saws for completion of this project would be evaluated using the "minimum tool" concept to successfully and safely accomplish the management objective with the least adverse effect on wilderness character and resources. The section of Sun Creek where the barriers would be installed is on land that was once lightly logged and has an old road that would allow access for the articulating backhoe and construction crews. The impacts of mechanized equipment versus a crew large enough to build the barriers would be fully evaluated.

Overall, this alternative is determined to be consistent with NPS policies governing wilderness management. Any adverse effects would be minimal and short term and would produce more significant, long term, beneficial effects.

5. **Fisheries:** Brook trout and brook trout/bull trout hybrids would be completely removed from the park section of Sun Creek below the bull trout with Antimycin and above the bull trout with electrofishing. All fish would be completely removed from Lost Creek with the use of Antimycin or electrofishing. Bull trout would be introduced into Lost Creek on a temporary basis until Sun Creek is recolonized. The removal of brook trout from Sun Creek would allow the native bull trout to survive and increase in numbers by increasing their available habitat.

6. **Other Wildlife:** The proposed activity, including antimycin treatment, would not adversely affect birds or mammals. The treatment would result in a short term reduction in available food source for piscivores (fish-eating predators); however, fish would still be abundant downstream and in nearby streams. Aquatic macroinvertebrate populations in the creeks would be temporarily reduced by the application of antimycin. A study conducted by a private consulting entomologist, states that these populations of invertebrates would be recolonized rapidly by airborne, upstream and sidestream sources. This effect would be minor and of short duration.

7. Cultural Resources: No cultural resources are known to exist in the project area, however, no work would commence until all necessary cultural resource surveys and compliance needs are addressed in accordance with the National Historic Preservation Act. Should additional surveys reveal previously unidentified resources, all necessary mitigation actions would be employed to eliminate any adverse effects.

8. Recreation: The elimination of brook trout would result in the loss of Lost Creek to recreational fishing. Due to the availability of additional streams in the area and the limited use Lost Creek receives at this time, this effect is determined to be minor.

9. Vegetation: An old logging road would provide access to within 100 yards of the lower barrier site with virtually no disturbance. Disturbance to vegetation over the remaining 100 yards would be minimal. This would be the case with either of the two possible construction methods. Access to the upper barrier site would require traversing areas within the park where no trail system exists. Construction of the barriers would cause minimal disturbance to the surrounding vegetation in the immediate vicinity. Due to the slope of the channel at the barrier sites, minor inundation of stream-side vegetation (mosses and grasses) and habitat would occur. One standing tree, at each barrier site, would possibly be removed for the construction of the barriers. Every attempt would be made to utilize existing down trees. This alteration would be short term and of minimal effect on the vegetative resource.

Monetary expenses associated with this alternative include:

Year 1 - \$ 53,000 (barrier construction, treatment, personnel, peer panel, supplies, equipment)

Year 2 - \$ 28,000 (minor follow-up electrofishing effort, monitoring)

Year 3 - \$ 28,000 (minor follow-up electrofishing effort, monitoring)

Year 4 - \$ 28,000 (minor follow-up electrofishing effort monitoring)

**C. Alternative Three - Construction of Two In-Stream Barriers and Elimination of Brook Trout Through Electrofishing.**

The environmental consequences of this alternative would be similar to alternative 2, however, there would be limited effects to the aquatic macroinvertebrate communities.

Monetary expenses associated with this alternative include:

Year 1 - \$102,000 (barrier construction, treatment, additional personnel, peer panel, supplies, additional equipment)

Year 2 - \$ 89,000 (major follow-up electrofishing effort,  
monitoring)

Year 3 - \$ 89,000 (major follow-up electrofishing effort,  
monitoring)

Year 4 - \$ 89,000 (major follow-up electrofishing effort,  
monitoring)

**D. Alternative Four - Construction of Two In-Stream Barriers, Temporary Removal of Bull Trout by Electrofishing, and Elimination of Brook Trout Through the Use of Piscicides.**

With the exception of Threatened and Endangered Species and Other Wildlife, the effects of this alternative would be the same as alternative 2.

1. **Threatened and Endangered Species:** Implementation of this proposal would potentially create undue mortality within the bull trout population through increased handling by removing them from the stream and transporting them or placing them in aeration tanks. The Recovery Team indicates that previous attempts to rear bull trout in hatchery situations have met with only marginal success. As it would be impossible to remove all bull trout before treatment, some mortality of bull trout would occur due to piscicides.

Spotted owls would not be affected in any way by this alternative.

2. **Other Wildlife:** Chemical treatment of the entire reach of Sun Creek within the park would affect more of the aquatic macroinvertebrate population. Recolonization by macroinvertebrates would require a longer time period than under alternative 2.

Monetary expenses associated with this alternative include:

Year 1 - \$ 53,000 (moving fish, barrier construction, treatment, personnel, peer panel, supplies, equipment)

Year 2 - \$ 53,000 (moving fish, follow-up electrofishing effort, monitoring)

Year 3 - \$ 28,000 (minor follow-up electrofishing effort, monitoring)

Year 4 - \$ 28,000 (minor follow-up electrofishing effort, monitoring)

Year 5 - \$ 28,000 (minor follow-up electrofishing effort, monitoring)

## V. CRITERIA FOR SELECTION OF ALTERNATIVES

The goal of this program is to meet the National Park Service policy of providing the American people with the opportunity to enjoy and benefit from natural environments evolving through natural processes minimally influenced by human action. This includes controlling non-native species wherever such species threaten park resources and interfere with natural processes and the perpetuation of native species (especially those that are endangered, threatened, or otherwise unique). This goal is consistent with the policy of identifying and promoting the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats, consistent with the legal requirements of the Endangered Species Act.

The preferred alternative was selected with this goal in mind.

A. Identification of the Preferred Alternative and Mitigation measures to be Applied.

Preferred Alternative

Based on the environmental analysis and NPS Management Policies, Alternative 2 is preferred: that is the construction of two barriers in Sun Creek and the removal of non-native fish that cross-breed with bull trout and are in competition with them.

Alternative 2 would assist the recovery of bull trout by making more habitat available to this species. Alternative 2 would also eradicate a non-native species from some park streams, which is consistent with NPS Policy.

Approximately 7 miles of Sun Creek would be temporarily affected by this action and all of the resources affected would be within the park. The effects would include restricted access, some disturbance of vegetation, minor inundation of stream-side vegetation and the temporary reduction of fish and invertebrate populations in the creek. This area of the park receives very little use by park visitors and the restricted access would be of a very short duration (approximately three days). All other effects to the natural system are determined to be short term ultimately yielding long term benefits.

The NPS recognizes the importance of wilderness areas in providing habitat for endangered and threatened species and that chemical treatment may be necessary to prepare waters for the re-establishment of native species.

It is the opinion of the Recovery Team that the chances of complete removal of brook trout in the lower section of Sun Creek would be greatly reduced by solely utilizing electrofishing techniques suggested in alternative 3. Removing the fish in this section of Sun Creek with electrofishing would be difficult and less effective due to stream flow regimes and the structural complexity of the stream channel. Short-term and long-term costs would also increase due to increased labor and the need for repeated intensive electrofishing treatments for several years.

It is also the opinion of the Recovery Team that removing the entire population of bull trout from Sun Creek, as suggested in alternative 4, presents too high of a risk to the bull trout population at this time. Electrofishing all of the bull trout from the creek and transporting them or placing them in aeration tanks has potential to kill some of the trout. The preferred alternative provides for non-native fish removal above and below the bull trout population, while leaving the bull trout in place. This small population would be adversely affected by any loss in its numbers.

## Comparison of Alternatives

Consideration	ALT. 1	ALT. 2	ALT. 3	ALT. 4
1. Assist in recovery of bull trout.	NO	YES	YES	YES
2. Consistent with goals and policies of NPS.	NO	YES	YES	YES
3. Maintain Water Quality.	YES	YES*	YES	YES*
4. Optimize removal of non-native trout.	NO	YES	NO	YES
5. Safe from risk to bull trout.	NO	YES	YES	NO

\* Antimycin would be neutralized with potassium permanganate and/or contained.

## Mitigation Measures

1. Impacts due to antimycin. Antimycin is an Environmental Protection Agency registered chemical for the use of removing fish from waters within the United States. Antimycin usually degrades rapidly in high gradient stream environments, such as Sun Creek, without neutralization. However, to ensure no downstream impacts, neutralization stations (using potassium permanganate) would be established on Sun Creek at the location of the lower barrier. These stations would be manned at all times to ensure that only the correct amount enters the stream to neutralize the antimycin. A cage containing live fish would be placed in Sun Creek below the neutralization station. If mortality or undue stress is observed in these fish, additional detoxification stations would be activated.

2. Dead Fish. Dead fish would be collected and utilized for scientific analysis. After this they would be disposed of on the banks of the creek. Antimycin is an antibiotic and any animal consuming fish that have been killed with it would not be harmed in any way.

3. Public protection. The area being treated would be signed and staff would be available on site to monitor public entry.

4. Construction of fish barriers. These barriers would be necessary to prevent non-native fish from traveling up stream into the bull trout habitat. They would be constructed with mostly natural materials, and would look like and act as waterfalls. Fish and other stream inhabitants would be able to migrate downstream. Any effects to the surrounding soil and vegetation would be minimal.

5. Costs. Costs associated with this project would be the responsibility of the NPS.



## Monitoring Requirements

1. Application of chemicals. The application of antimycin would be supervised by the NPS. Assistance from representatives of the following agencies would be available: USFWS, USFS, Oregon Department of Fish and Wildlife, Desert Fishes Council and Oregon State University.
2. Permits. Both Federal and State control permits would be applied for and obtained prior to application of antimycin. All monitoring and reporting requirements associated with these permits would be complied with. A U.S. Army Corps of Engineers 404 permit would be obtained prior to project initiation to conform with the Clean Water Act.
3. Monitoring. Crater Lake National Park personnel would monitor the bull trout population to evaluate the success of the project. Recolonization of aquatic macroinvertebrates would be monitored. The barriers would be annually evaluated for structural integrity.
4. Documentation. Sun Creek antimycin treatment procedures used during the reclamation project would be documented and maintained on file at the park.

## Public and Agency Concerns

During the agency scoping period, concerns were expressed about water quality, proposed wilderness management, recreation, threat to bull trout, and life-span of the fish barriers.

1. **Water quality.** There are concerns over water quality associated with the use of antimycin to eliminate fish from Sun Creek.

Antimycin and potassium permanganate would be neutralized at the lower barrier. The use of these chemicals would not affect downstream water quality for wildlife or livestock. No water is removed downstream for human consumption.

The use of chemicals for the removal of fish from any water is a complicated process. The application and approval of chemical fish control is regulated by several agencies. Use of antimycin is addressed in section II of this EA. This project would be completed only if the Fish Control Permits are granted.

2. **Proposed wilderness.** There are concerns that the proposed actions are not compatible with a proposed wilderness area.

The protection, stabilization and restoration of a native species within a National Park and wilderness area is consistent with policies governing these areas, and is preferred over the perpetuation of non-native species.

The use of a motorized vehicle and gas powered saws would be evaluated using the "minimum tool" concept to successfully and safely accomplish the management objective with the least adverse effect on wilderness character and resources. The section of Sun Creek where the barriers would be installed is

on land that was once lightly logged and has an old road that may allow access for the articulating backhoe. The impacts of mechanized equipment versus a crew large enough to build the barriers must be fully evaluated.

3. **Recreation.** There are concerns over the loss of backcountry fishing in the area.

Fishing opportunities provided by Sun and Lost Creeks are utilized by few visitors. The largest fish found in Sun Creek was 8 1/2 inches and the average size fish in this creek is closer 4-7 inches. The average size of fish sampled in Lost Creek is 3-5 inches. Presently Sun Creek is closed to angling and will remain closed as long as bull trout are threatened or endangered. There are other similar fishing opportunities near Sun and Lost Creeks.

4. **Bull Trout.** There are concerns over possible negative impacts to the bull trout from the proposed treatment.

There would be no chemicals released upstream from the bull trout, therefore, they would not be affected in any way by the chemicals. Care would be taken not to harm the bull trout with the electrofishing techniques that would be utilized. The bull trout would greatly benefit from this proposal.

5. **Life-span of barriers.** There are concerns over the life-span of the barriers.

The construction techniques proposed would result in barriers that would have a life expectancy of 50+ years with a very low risk of failure. By having two barriers, the chance of non-native trout reoccupying bull trout habitat would be reduced. If one barrier were to fail, the other would continue to keep the brook trout from returning. The barriers would be monitored every year and repairs would be made as necessary.

## VI. LIST OF PREPARERS

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## VII. LIST OF PERSONS AND AGENCIES CONSULTED

Donald Bramhall, Environmental Specialist, Oregon Department of Environmental Quality, Bend, Oregon.

George Buckingham, Chief Park Ranger, National Park Service, Crater Lake, Oregon.

John Fortune, District Biologist, Oregon Department of Fish and Wildlife, Klamath Falls, Oregon.

Gene Foster, Department of Environmental Quality, Portland, Oregon.

Steve Gibbons, Regional Integrated Pest Manager, National Park Service, Pacific Northwest Regional Office, Seattle, Washington.

Bob Hooton, Trout Program Leader, Oregon Department of Fish and Wildlife, Portland, Oregon.

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Colorado Fish and Wildlife Assistance Office  
730 Simms, Rm 290  
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Oregon Department of Fish and Wildlife  
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Portland, Oregon 97207

U.S. Forest Service  
1645 Hwy. 20 East  
Bend, Oregon 97701

Desert Fishes Council  
P.O. Box 337  
Bishop, California 93514

Table 1. Site, Flow, Concentration of Antimycin, Duration and Total Amount of Antimycin Required, Sun Creek Bull Trout Project, Oregon 1992.

First Day of Treatment:

Site	Elevation Feet	Flow CFS	PPB Ant.	Duration Hours	Total MLS Antimycin
2. End, Bull trout section	5,250	8.0	9.9	8	651
3.	5,000				
4. Barrier	4,700	10.5	KMnO <sub>4</sub> Station		

Second Day of Treatment:

Site	Elevation Feet	Flow CFS	PPB Ant.	Duration Hours	Total MLS Antimycin
2. End, Bull trout section	5,250		No	Treatment	
3.	5,000	10.0	8.0	8	650
4. Barrier	4,700	10.5	KMnO <sub>4</sub> Station		

Figure 1. Sun and Lost Creeks, Crater Lake National Park, Oregon.

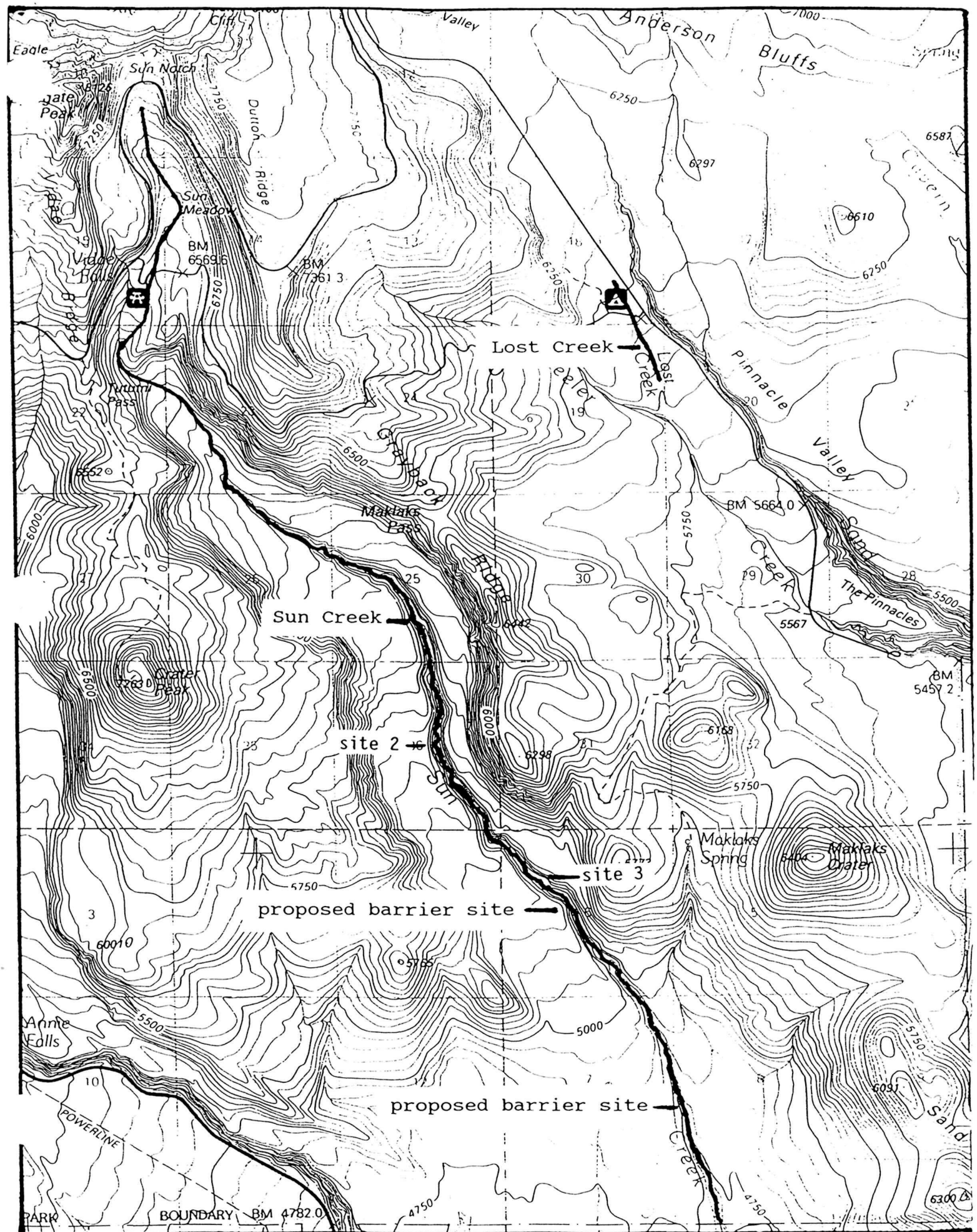
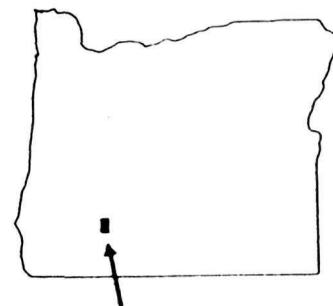
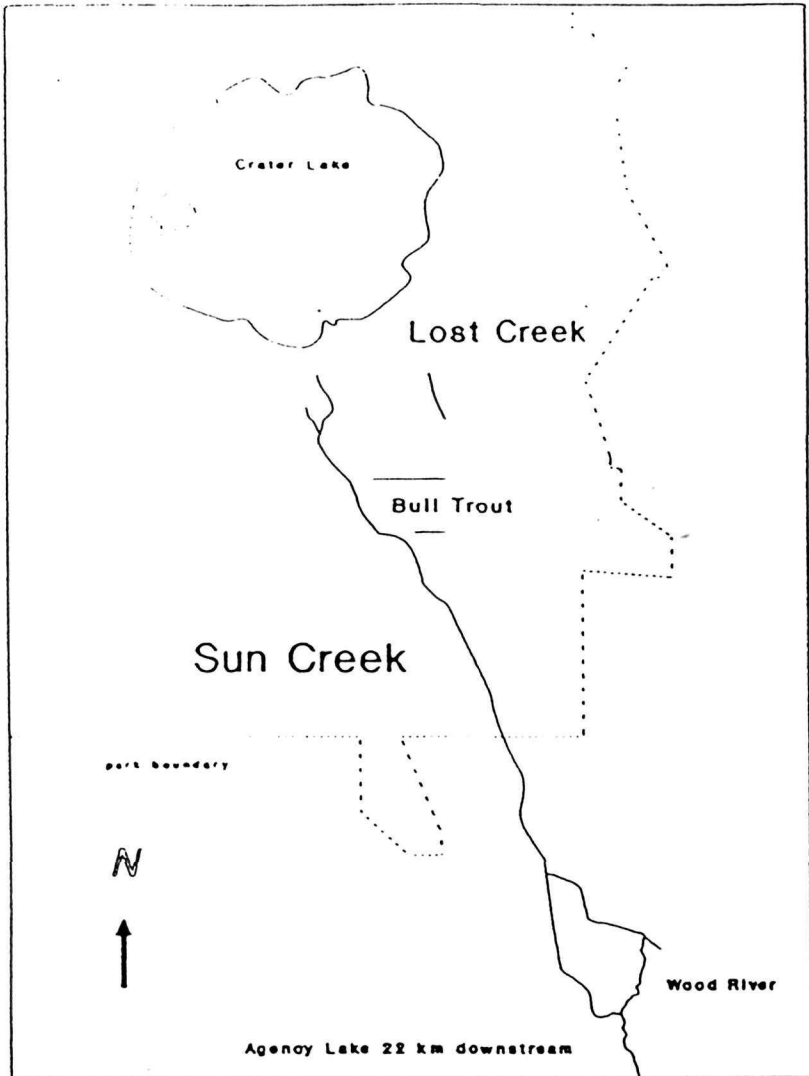


Figure 2. Crater Lake National Park vicinity map.



ENLARGED AREA