

MINIMUM REQUIREMENTS ANALYSIS and DECISION GUIDE

(Adapted from the Arthur Carhart National Wilderness Training Center's Minimum Requirements Decision Guide Workbook and reformatted for 508 compliance)

Project Title: Westslope Cutthroat Trout and Bull Trout Preservation in the Upper Camas Drainage, Glacier National Park (GLAC-19-066)

This Minimum Requirements Analysis/Minimum Requirements Decision Guide is a two-step process. Step 1 determines whether administrative action is necessary in Glacier National Park's recommended wilderness for the administration of the area as wilderness. If Step 1 determines that action is necessary, Step 2 identifies the means of taking action that is least impactful to the five qualities of wilderness character. The five qualities include untrammeled, undeveloped, natural condition, opportunities for solitude and unconfined and primitive recreation, and other features of value.

Step 1: Determine if administrative action is necessary

Description of the situation

Native westslope cutthroat trout and bull trout populations in Glacier National Park are increasingly at risk from the severe, negative effects of introduced non-native fish. Non-native Yellowstone cutthroat trout in Camas Lake and Lake Evangeline in the upper Camas drainage present an ongoing risk of hybridization to downstream westslope cutthroat trout populations. Hybridization disrupts local adaptations that confer fitness advantages, and weakened fitness can result in lower reproductive rates and reduced resiliency to disease and environmental stressors. Left unchecked, hybridization and competition from Yellowstone cutthroat trout have the potential to expand downstream and cause observable demographic changes among native westslope cutthroat trout populations, including decreased abundance and distribution, and will jeopardize the currently healthy genetic status of westslope cutthroat in Trout and Arrow Lakes. As hybridization with Yellowstone cutthroat trout continues, the result will be eventual loss of westslope cutthroat conservation populations at Trout, Arrow, and Rogers Lakes.

Genetically pure populations of westslope cutthroat trout in the park are already at risk, with some populations facing extirpation and/or a loss of historic genetic lineages due to competition and hybridization with non-native fish. In the North Fork of the Flathead River system, of which the Camas drainage is a tributary, important genetic characteristics of native westslope cutthroat trout that evolved in the North Fork are threatened by expanding non-native rainbow trout. Non-hybridized populations of westslope cutthroat trout occupy less than ten percent of their historic range in the US (Shepard et al. 2005), and less than three percent in Montana (Liknes and Graham 1998).

Additionally, bull trout in Rogers Lake in the Camas drainage are likely threatened by non-native invasive lake trout. Several bull trout populations in the park are at near risk of functional extinction due to non-native lake trout. There is no long-term data on how non-native lake trout are specifically affecting bull trout in Rogers Lake. But based on what is known about the effects on non-native lake trout on other bull trout populations, non-native lake trout could drive down or completely replace bull trout in Rogers Lake.

The stressors to westslope cutthroat trout and bull trout from non-native fish are compounded by climate change and associated habitat changes, such as altered precipitation patterns, higher water

temperatures, and damage to spawning beds from flood events. Changes in stream flow and increasing frequency and intensity of disturbances, such as wildfire and rain-on-snow events, also have the potential to impact native fish (Williams et al. 2009). Research suggests a trend of increasing stream temperatures in the Crown of the Continent Ecosystem (Jones et al. 2017). Bull trout in Rogers Lake may be at a particularly high risk from climate-related impacts. This is because the lake is shallow (approximately 14 feet) and, as a result, especially susceptible to increases in water temperatures, which could rise to the point where bull trout are not able to persist there for the long term.

Glacier has a critical role in the conservation of westslope cutthroat trout, listed by Montana as a species of concern, and bull trout, also a state listed species of concern and federally listed as threatened under the Endangered Species Act. The park contains a high proportion of natural lake (i.e. undammed) core areas for westslope cutthroat trout and bull trout, and is considered a stronghold for both species (Liknes and Graham 1988; Behnke 1992; Shepard et al. 2005; Muhlfeld et al. 2016). In the US, Glacier supports approximately one-third of the remaining bull trout populations inhabiting natural lakes (Fredenberg et al. 2007). Trout, Arrow, and Rogers Lakes in the Camas drainage are among several identified westslope cutthroat trout conservation populations in the park (Muhlfeld et al. 2016). Westslope cutthroat trout and bull trout are essential to maintaining biodiversity throughout the Crown of the Continent Ecosystem, are part of a historic fishery that is fundamental to Glacier's designation as a biosphere reserve and World Heritage Site, and have long been integral to the culture of the park and surrounding communities.

This MRDG explores the minimum tool for removing non-native Yellowstone cutthroat trout and preserving native westslope cutthroat trout and bull trout in the upper Camas drainage.

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Options Outside of Wilderness

There are no options outside of recommended wilderness, because the Camas drainage is located within the park's recommended wilderness boundary.

Criteria for Determining Necessity

Is action necessary to meet any of the following criteria?

A. Valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws).

No. None of the special provisions in the Wilderness Act are applicable to Glacier National Park.

B. Requirements of other federal laws?

Yes. The 1916 Organic Act that established the National Park Service, the park's enabling legislation, the 1978 Redwood Act, and the NPS Management Policies (2006) all direct the National Park Service to conserve and manage native populations of plants and animals within the parks in an unimpaired state for the enjoyment of future generations.

Endangered Species Act (ESA) (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq.) "Section 7(a)(1) of the Act directs Federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to utilize their authorities to further the purposes of the Act by carrying out conservation programs for listed species."

C. Wilderness Character

Is action necessary to preserve one or more of the five qualities of wilderness character?

1. UNTRAMMELED

No. Taking action is not necessary to preserve the untrammeled (or uncontrolled) quality of recommended wilderness.

2. UNDEVELOPED

No. Action is not necessary to preserve the undeveloped state of recommended wilderness within Glacier National Park.

3. NATURAL

Yes. Action is necessary to reduce the risk of hybridization between native westslope cutthroat trout and non-native Yellowstone cutthroat trout in the Camas drainage; conserve genetically pure westslope cutthroat trout populations, including conservation populations in Trout, Arrow, and Rogers Lakes; and increase the protection of native westslope cutthroat trout populations downstream and throughout the North Fork system. Action is also necessary to protect the overall, long-term distribution of native bull trout, and protect populations of bull trout and westslope cutthroat trout from habitat stressors associated with climate change. Because healthy native fish populations are an integral part of the natural condition of the park's recommended wilderness, action is necessary to preserve this quality of wilderness character.

4. SOLITUDE OR PRIMITIVE and UNCONFINED RECREATION

No. Action is not necessary to preserve this quality.

5. OTHER FEATURES OF VALUE

Yes. Glacier National Park has a notable legacy of research and scientific accomplishment in the study of ecological systems and the protection of natural

resources. Scientific research in the park includes investigations of genetically healthy native fish populations, the effects of non-native fish on native fish and aquatic ecosystems, and methods for controlling non-native fish and protecting native species. Failure to take action to protect native fish in the Camas drainage would represent the loss of a valuable opportunity for continued research on genetically intact populations of westslope cutthroat trout, the control of non-native species, and the conservation of native species. Action is, therefore, necessary to preserve the scientific and educational value of the park's recommended wilderness.

Other Direction

Has the issue been addressed in agency policy, management plans, species recovery plans, or agreements with other agencies or partners?

Yes. Executive Order 13112, "Invasive Species," requires federal agencies to control invasive species populations and "provide for restoration of native species and habitat conditions," and Executive Order 13751, "Safeguarding the Nation from the Impacts of Invasive Species," amends Executive Order 13112 and "directs actions to continue coordinated Federal prevention and control efforts related to invasive species" (USDA National Agricultural Library National Invasive Species Information Center <https://www.invasivespeciesinfo.gov/laws/execorder.shtml#eo13112>).

National Park Service (NPS) Management Policies guide and regulate how the NPS carries out its authority and obligations under the laws. Section 4.1.5, states: "The Service will reestablish natural functions and processes in parks unless otherwise directed by Congress... Impacts on natural systems resulting from human disturbances include the introduction of exotic species; the contamination of air, water, and soil; changes to hydrologic patterns and sediment transport; the acceleration of erosion and sedimentation; and the disruption of natural processes. The Service will seek to return such disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated. The Service will use the best available technology, within available resources, to restore the biological and physical components of these systems, accelerating both their recovery and the recovery of landscape and biological community structure and function." Section 4.1.5 further states that such efforts may include "removal of exotic species" and "restoration of native plants and animals."

NPS Mgt. Policies Section 4.4.1.1 states, "In addition to maintaining all native plant and animal species and their habitats inside parks, the Service will work with other land managers to encourage the conservation of populations and habitats of these species outside parks whenever possible." Methods to meet this objective include "prevent the introduction of exotic species into units of the national park system, and remove, when possible, or otherwise contain individuals or populations of these species that have already become established in parks."

NPS Mgt. Policies Section 4.4.4 states, "Exotic species will not be allowed to displace native species if displacement can be prevented."

NPS Mgt. Policies Section 4.4.4.2 states, "All exotic plant and animal 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 exotic species [among others] interferes with natural processes and the perpetuation of natural features, native species or natural habitats" or "disrupts the genetic integrity of native species."

Section 6 of the NPS Mgt. Policies addresses wilderness preservation and management. Section 6.3.1 states "The National Park Service will take no action that would diminish the wilderness eligibility of an

area possessing wilderness characteristics until the legislative process of wilderness designation has been completed.”

NPS Mgt. Policies Section 6.3.5 states “All management decisions affecting wilderness must be consistent with the minimum requirement concept” to determine if administrative actions are necessary and how to minimize impacts.

NPS Mgt. Policies Section 6.3.7 addresses the management of natural resources within wilderness management areas. This section states: “Without natural resources, especially indigenous and endemic species, a wilderness experience would not be possible,” and “Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and influences originating outside of wilderness boundaries.”

NPS Natural Resource Management Reference Manual 77 provides guidance to NPS employees responsible for managing, conserving, and protecting the natural resources in NPS units. The “Freshwater Resources Management” section states, “Direct species interventions may be required in some cases when native species are absent from the aquatic ecosystem or when nonnative species are present.” This section further acknowledges that “Restoration of native aquatic populations that have been impacted by the introduction of one or more nonnative species will usually require physical intervention, capture, and removal of the nonnative species. Such restoration may also require supplemental restocking of the native species,” and that “Direct restoration measures will usually require severe treatment of the aquatic community either through poisoning of all habitat used by nonnatives within the area to be restored or temporary water diversion and clean-up of the desired habitat.”

Time Constraints

What, if any, time constraints may affect the action?

Taking action cannot be delayed to the point where hybridization with non-native Yellowstone cutthroat trout decreases the genetic purity of native westslope cutthroat trout in Trout and Arrow Lakes. Taking action in as timely a manner as possible (within the next year or two) would be optimal for protecting westslope cutthroat trout conservation populations in the Camas drainage. Action must also be taken during late summer/early fall, before snow and winter conditions prohibit access and during low water when impacts to wetlands, vegetation, aquatic organisms, and visitor use and experience would be minimized as much as possible.

Step 1 Decision

Is administrative action necessary in wilderness?

Yes. As explained above, action is necessary to protect the natural condition of the park’s recommended wilderness, as well as features of scientific and educational value. Action is also necessary to comply with the ESA, since bull trout are federally listed as threatened and the National Park Service has an affirmative duty to develop and implement programs for conservation of the species. Action is necessary within recommended wilderness, because the Camas drainage is within the park’s recommended wilderness boundary.

Summary of Decision Criteria

- A. Existing Rights or Special Provisions:** NO
- B. Requirements of Other Legislation:** YES
- C. Wilderness Character**
 - 1. Untrammeled: NO
 - 2. Undeveloped: NO

3. Natural: YES
4. Outstanding Opportunities: NO
5. Other Features of Value: YES

Step 2: Determine the Minimum Activity

Components of the Action

Identify the discrete components or phases of the action.

There are six discrete components to taking action. They include:

1. Removal of non-native Yellowstone cutthroat trout
2. Closure of treatment area
3. Translocation of native westslope cutthroat trout and bull trout
4. Transport of personnel to the project area
5. Transport of equipment to the project area, and
6. Monitoring results

Alternatives

Alternative 1

Remove non-native Yellowstone cutthroat trout using rotenone, translocate native fish, and include motorized support and helicopters.

Description:

Removal of Yellowstone cutthroat trout

Rotenone, a fish toxicant, would be used to remove non-native Yellowstone cutthroat trout from Camas Lake, Lake Evangeline, and Camas Creek upstream of Arrow Lake. Rotenone would be applied throughout the project area from drip stations, gas-powered water pumps, and backpack sprayers; motorized watercraft would be used to apply rotenone to the lakes. Two motorboats would be used, one on each lake. The boats would run intermittently each day of the rotenone application period, estimated at up to approximately two to three days. Drip stations are generally a simple, non-motorized apparatus, such as a 5-gallon bucket or drip bag with tubing extending into the stream. Water pumps would be used to help distribute the rotenone as needed. Slow-release rotenone mixtures consisting of rotenone and an inert substance (such as sand and unflavored gelatin) would be used in areas of upwelling to prevent target fish from avoiding exposure in these areas. The rotenone would be released as the mixture breaks down in the water; the mixture would be contained (in a burlap bag, for example) and removed at the end of the treatment. Any dead fish that come to the surface would be collected and either sunk in the lakes or removed from the site to avoid attracting bears and other wildlife. The rotenone would be applied in late summer or early fall. The application period would be expected to last for an estimated two to three days. Given the extreme toxicity of rotenone to fish, it is expected that the majority (if not all) of the Yellowstone cutthroat trout would be removed. Some individual fish may survive, however. If Yellowstone cutthroat trout are present during post-treatment sampling, a second application may be employed during the same or a following year to remove the remaining fish. If reapplication of the rotenone is necessary, some equipment may be temporarily cached onsite (e.g. boat motors would likely be hauled out but the boats without motors and other equipment may be cached).

Prior to the application of rotenone, fluorescein, a non-toxic dye, would be applied to the stream and tracked to confirm the flow rate. Fluorescein dye is routinely used to study surface and groundwater flow patterns, and is inert and non-toxic.

After application of the rotenone, a potassium permanganate solution would be used to detoxify the stream and neutralize the rotenone before it reaches native fish populations. The potassium permanganate would only be applied to Camas Creek. Camas Lake and Lake Evangeline would not be treated with potassium permanganate, but would be left to detoxify naturally. The potassium permanganate would be applied to the stream from a detox station upstream of Arrow Lake by means of an auger dispenser powered by a generator. The generator would operate continuously (24 hours a day, 7 days a week) until the rotenone detoxifies. The application of potassium permanganate to the stream would continue until sentinel fish caged at the downstream end of the detox area survive for four hours without any sign of stress. Detoxification with potassium permanganate is currently estimated to take place for approximately two to three weeks.

Certified Piscicide Applicators and trained staff would oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, MFWP, and NPS policy. Approximately 15 project personnel would be on site. Personnel would likely camp at the backcountry campgrounds at Camas and/or Arrow Lakes for the duration of the rotenone application and detoxification period. Personnel would also likely camp at Lake Evangeline.

The treatment area would be temporarily closed to the public during rotenone application and detoxification. The closure would extend from the head of Arrow Lake to Ruger Lake, and include the Camas Creek Trail and Camas Lake backcountry campground. The closure would be in place from late summer/early fall when the project begins, until the following spring. The Arrow Lake backcountry campground at the foot of Arrow Lake would also be temporarily closed because it would be occupied by project personnel. The closure of the Arrow Lake backcountry campground would only be in effect during implementation of the project; Arrow Lake and the Camas Creek Trail to the head of Arrow Lake would remain open during this time.

Translocation of native fish

Following the removal of Yellowstone cutthroat, bull trout and genetically pure westslope cutthroat trout would be translocated into the lakes. If water temperatures at Camas Lake are not optimal for bull trout, bull trout may only be stocked into Lake Evangeline and left to migrate freely into Camas Lake. Translocated fish would come from donor populations within the Camas drainage or other drainages that are similar or near enough on the landscape to have undergone similar evolutionary pressures. Collection of the donor fish would likely begin in 2019. The physical transfer or planting, of the hatchery-reared fish would not begin until the spring of 2020 at the earliest, but may begin later depending on the amount of time needed for the hatchery to raise a sufficient number of mature fish. Native westslope cutthroat trout would be translocated first, followed by bull trout, possibly beginning in the spring of 2021 at the earliest.

Westslope cutthroat trout and bull trout would be collected from donor populations using methods such as angling, dip netting, trapping, electrofishing, and/or seining. Collected westslope cutthroat trout would be taken to a hatchery outside the park where they would be spawned, and where the fertilized eggs would be hatched and raised. Collected bull trout would be spawned and released onsite (generally within 24 hours of capture), and the spawned/fertilized bull trout eggs would be taken to a hatchery outside the park where they would also be hatched and raised. The hatchery-raised westslope cutthroat trout and bull trout would remain in the hatchery until they are approximately two years of age, after which they would be transported by helicopter or pack stock to Camas Lake and/or Lake Evangeline. The juvenile fish would be directly released into the lakes from helicopter tanks immediately above the

water surface, or released from coolers or other containers from the shoreline. Westslope cutthroat trout and bull trout may also be moved directly from source waters to the lakes without hatchery propagation. Or, gametes (eggs and sperm) may be collected from spawning adults, fertilized, and reared naturally in stream-side incubators in the new habitat, whereby the fish could swim into the lakes from the stream. Incubators are typically a small (approximately 8-inch x 8-inch) plastic basket or bucket or similar container that would be filled with gravel and eggs. Incubators would not require the use of any motorized equipment. Depending on the success of hatchery propagation and the number of fish that can be translocated to Camas Lake and Lake Evangeline at a given time, collection procedures may need to be repeated each year for an estimated three years. The translocation, or physical transfer or planting, would likely take place over multiple years (estimated six to seven) to establish multiple age classes of both species. Translocated fish would be monitored, which could require marking them with tags, fin clips, or other means and tracking them using fixed-location remote stations.

Project transportation needs

Project personnel would hike to the project area for all phases of the project. Because there is no trail to Lake Evangeline and due to the weight of the rotenone (anticipated at approximately 12,000 pounds) and other equipment, helicopters would be necessary to transport boats, rotenone, the generator, water pumps, and possibly other equipment. Helicopters would also be used to transport fish and fish eggs during native fish translocation (including flying collected fish and eggs out of the project area and planting fish into the lakes), since the time required for ground transport and the jostling from using livestock or backpacks would put the fish and/or eggs at risk. Helicopters would deliver and pick up equipment (and fish) by means of long-line sling loads. The number of flights would range from an estimated six to ten inbound flights and three to six outbound flights for rotenone application, followed by an estimated four flights per year for six or seven years for translocation.

Component Activities for Alternative 1

How will each of the components of the action be performed under this alternative?

Component Number	Component Description	Component Activity for Alternative 1
1	Removal of non-native Yellowstone cutthroat trout	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). • Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary.
2	Closure of treatment area	<ul style="list-style-type: none"> • The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. • The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks.

Component Number	Component Description	Component Activity for Alternative 1
3	Translocation of native westslope cutthroat trout and bull trout	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).
4	Transport of personnel to the project area	Personnel would hike to the project area.
5	Transport of equipment to the project area	Transport equipment with packstock and helicopters.
6	Monitoring results	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.

Effects to Wilderness Character from Alternative 1

What is the effect of each component activity for Alternative 1 on the qualities of wilderness character?

a. UNTRAMMELED

Component No.	Component Activity for Alternative 1	Effect
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary. 	Negative effect
2	<ul style="list-style-type: none"> The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks. 	No effect
3	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	No effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects Two negative effects
	Effect Rating (sum of positive and negative effects)	minus 2

Explain: The lethal removal of non-native Yellowstone cutthroat trout and the translocation of native fish would negatively affect the untrammeled quality of wilderness character, because these actions would be intentional manipulations of the biophysical environment.

b. UNDEVELOPED

Component No.	Component Activity for Alternative 1	Effect
1	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). • Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary. 	Negative effect
2	<ul style="list-style-type: none"> • The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. • The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks. 	No effect
3	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Negative effect
	Total number of positive and negative effects	Zero positive effects 4 negative effects
	Effect Rating (sum of positive and negative effects)	minus 4

Explain: The use of motorboats, motorized equipment, and helicopter operations would negatively affect the undeveloped quality of wilderness character. Temporary streamside incubators, remote monitoring stations, and fish markers would also negatively affect this quality, as these devices are considered installations.

c. NATURAL CONDITION

Component No.	Component Activity for Alternative 1	Effect
1	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). • Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary. 	Negative and positive effect
2	<ul style="list-style-type: none"> • The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. • The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks. 	No effect
3	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).	Positive effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect
	Total number of positive and negative effects	3 positive effects 2 negative effects
	Effect Rating (sum of positive and negative effects)	Plus 1

Explain: The removal of non-native Yellowstone cutthroat trout and the translocation of native fish would benefit the natural condition of wilderness character because it would preserve and protect indigenous species and ecological processes. These benefits would be permanent, since non-native fish and the risk they present would be removed from the system, and the treatment area is secure against reinvasion. Monitoring translocated native fish would benefit the natural condition because it would provide valuable data necessary for the success of the project, and which could also be used to inform native fisheries conservation elsewhere in the park.

This alternative would also have temporary negative effects to the natural condition from the motorized noise produced during project implementation and the mortality of amphibians, aquatic invertebrates, and individual native fish. Negative impacts from mortality would be temporary because populations would either not be affected or would recover.

d. SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component No.	Component Activity for Alternative 1	Effect
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary. 	Negative effect
2	<ul style="list-style-type: none"> The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks. 	Negative effect
3	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects 4 negative effects
	Effect Rating (sum of positive and negative effects)	minus 4

Explain: The use of motorboats and motorized equipment during rotenone application and detoxification and the use of helicopters during rotenone application and native fish translocation would negatively affect opportunities for solitude due to noise disturbances. The area closure during rotenone application would also impact this quality because unconfined recreation would be temporarily restricted in the closure area.

e. OTHER FEATURES OF VALUE

Component No.	Component Activity for Alternative 1	Effect Rating
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, with the assistance of motorboats and other motorized equipment (e.g. water pumps, generator). Rotenone application would take an estimated 2 to 3 days; detox would take approximately 2 to 3 weeks. A second application may or may not be necessary. 	Positive and negative effect

Component No.	Component Activity for Alternative 1	Effect Rating
2	<ul style="list-style-type: none"> The treatment area would be closed to public access from the head of Arrow Lake to Ruger Lake from late summer/early fall until the following spring. The Arrow Lake backcountry campground may be occupied by personnel and unavailable to the public for an estimated 3 to 4 weeks. 	No effect
3	Translocate native fish using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).	Positive and negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect
	Total number of positive and negative effects	3 positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	zero

Explain: The removal of non-native fish and translocation of native fish would benefit features of scientific and education value in Glacier's recommended wilderness because it would provide a valuable research opportunity, investigating methods of preserving and protecting native fish and aquatic ecosystems that are at risk from non-native fish and climate change. This alternative would also protect opportunities for continued research on genetically intact populations of westslope cutthroat trout. The visible presence of motorboats on the lakes and the use of work lights at night would adversely impact scenic values, but effects would be temporary, ending once the boats are removed and the project is completed, and would not be observable since the project area would be closed to public access. Helicopter flights would adversely affect scenic values along the flight path. Marking and tracking translocated fish would benefit scientific values because it would provide data on fish movement and the success of the project, and because the information gained could inform fisheries research and management elsewhere in the park.

Summary of effects rating for Alternative 1

Untrammeled: minus 2

Undeveloped: minus 4

Natural: plus 1

Solitude or Primitive and Unconfined Recreation: minus 4

Other Features of Value: zero

Summary Rating: minus 9

Alternative 2

Remove non-native Yellowstone cutthroat trout using rotenone, translocate native fish, no motorized support and helicopters

Description:

Removal of Yellowstone cutthroat trout

Rotenone, a fish toxicant, would be used to remove non-native Yellowstone cutthroat trout from Camas Lake, Lake Evangeline, and Camas Creek upstream of Arrow Lake. Exclusively non-motorized methods would be used. Rotenone would be applied from hand-propelled watercraft, drip stations, backpack sprayers, and a slow-release agent. Due to the time that would be required to distribute the rotenone with these methods, application would begin as early in the season as possible after the peak runoff period (possibly early to mid-summer), and would continue until winter weather conditions become prohibitive. Any dead fish that come to the surface would be collected and either sunk in the lakes or removed from the site to avoid attracting bears and other wildlife.

Multiple applications would be required to kill a sufficient number of fish, since the methods used would not thoroughly distribute the rotenone throughout the system. Rotenone applications would, therefore, be underway every year for multiple years until monitoring determines that enough non-native Yellowstone cutthroat trout have been removed to reduce risks to native westslope cutthroat trout conservation populations downstream and to enable the successful establishment of translocated westslope cutthroat in the upper Camas drainage. Even with multiple applications, a sufficient kill of non-native Yellowstone cutthroat trout may not be possible.

As with Alternative 1, a potassium permanganate solution would be applied to Camas Creek to detoxify the stream and neutralize the rotenone; Camas Lake and Lake Evangeline would be left to neutralize naturally. The potassium permanganate would be applied to the stream from a drip station consisting of a large, 50-gallon bag with a hose extending into the stream. Due to its size, the bag would need to be placed on flat terrain, such as a large, flat gravel bar. The drip bag location would be within approximately 160-170 meters of Arrow Lake, since stream morphology further upstream (where the detox station would be located under Alternative 1) is too steep and incised, with no locations that are large and flat enough for the bag. With the drip station in such close proximity to Arrow Lake, there would be some risk of rotenone reaching native fish populations in Arrow Lake before it could be completely detoxified (i.e. there would not be sufficient mixing time with the neutralizing agent, which can only be achieved over flow distance).

Certified Piscicide Applicators and trained staff would oversee the application of the rotenone and other chemicals, as required by the Montana Department of Agriculture, MFWP, and NPS policy. An estimated 15-20 or more project personnel would be on site. Personnel would camp at the backcountry campgrounds at Camas and/or Arrow Lakes for the duration of the rotenone application and detoxification period; personnel would also likely camp at Lake Evangeline. The treatment area would be temporarily closed to the public during rotenone application and detoxification. The closure would be in place from late spring/early summer until the following spring every year for multiple years until after the removal of non-native Yellowstone cutthroat trout. The closure would extend from the foot of Arrow Lake (as opposed to the head, under Alternative 1, since rotenone would likely reach Arrow Lake) to Ruger Lake, and include the Camas Creek Trail and Camas Lake and Arrow Lake backcountry campgrounds.

Translocation of native fish

The translocation of westslope cutthroat trout and bull trout would generally occur as described for Alternative 1, except helicopters would not be used to transport the fish. Collected fish would be

transported out of the area on foot or with packstock for eventual transfer to the hatchery. After hatchery rearing, fish would be transported back to the project area on foot or with packstock, and released into the lakes from the shoreline. Westslope cutthroat trout and bull trout may also be moved directly from source waters to the lakes without hatchery propagation. Or, gametes (eggs and sperm) may be collected from spawning adults, fertilized, and reared naturally in stream-side incubators in the new habitat, whereby the fish could swim into the lakes from the stream.

Translocation of native fish would not begin for several years, since it would take considerable time to remove non-native Yellowstone cutthroat trout. Establishing multiple age classes of both westslope cutthroat trout and bull trout would also take time, likely on the order of 10 to 15 years or more, given limitations on the number of fish that could be transported and planted into the lakes at any given time due to transport methods, and because the time required for ground transport and the jostling from packstock or backpacks would result in injury and mortality to fish during transfer. Translocation of westslope cutthroat trout may not be possible under this alternative, if a sufficient number of non-native Yellowstone cutthroat trout are not removed (translocation of bull trout would still be possible, because non-native Yellowstone cutthroat trout do not present hybridization, predation, or competition risks to bull trout). Translocated native fish would be monitored, which could require marking them with tags, fin clips, or other means and tracking them using fixed-location remote stations.

Project transportation needs

Project personnel would hike to the project area. All equipment and fish would be transported on foot or with packstock. Since the Camas Creek Trail ends at the foot of Camas Lake, and due to the amount of equipment that would need to be packed in every year, including watercraft and an estimated 12,000 pounds of rotenone (requiring multiple trips with livestock) and the difficulty of the terrain, a trail would need to be constructed from the foot of Camas Lake to Lake Evangeline. A spur trail would also need to be cut from the Camas Creek Trail to the drip bag location above Arrow Lake in order to access the site with livestock and cumbersome equipment (since the existing trail deviates from the stream above Arrow Lake).

Component Activities for Alternative 2

How will each of the components of the action be performed under this alternative?

Component No.	Component Description	Component Activity for Alternative 2
1	Removal of non-native Yellowstone cutthroat trout	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. • Multiple rotenone applications would be necessary over the course of several years. • Locate detox station approximately 160-170 meters upstream of Arrow Lake.
2	Closure of treatment area	<ul style="list-style-type: none"> • The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. • Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season.

Component No.	Component Description	Component Activity for Alternative 2
3	Translocation of native westslope cutthroat trout and bull trout	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout may not be possible.
4	Transport of personnel to the project area	Personnel would hike to the project area.
5	Transport of equipment to the project area	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake.
6	Monitoring results	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.

Effects to Wilderness Character from Alternative 2

What is the effect of each component activity for Alternative 2 on the qualities of wilderness character?

a. UNTRAMMELED

Component No.	Component Activity for Alternative 2	Effect Rating
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. Multiple rotenone applications would be necessary over the course of several years. Locate detox station approximately 160-170 meters upstream of Arrow Lake. 	Negative effect
2	<ul style="list-style-type: none"> The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season. 	No effect

Component No.	Component Activity for Alternative 2	Effect Rating
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout may not be possible. 	Negative effect
4	Personnel would hike to the project area.	No effect
5	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake. 	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	minus 3

Explain: The untrammeled quality of wilderness character would be negatively affected by the lethal removal of Yellowstone cutthroat trout and the translocation of native fish, since these actions would intentionally manipulate the biophysical environment. Multiple treatments would extend the scale and prolong the duration of negative effects due to increased mortality of amphibians and aquatic insects during multiple, yearly applications. Locating the detox station near Arrow Lake would intensify the effects due to an increased risk of mortality to native fish. The construction of new trails would result in an indirect manipulation of the biophysical environment (altering vegetation, soils, and habitat), which would also negatively affect the untrammeled quality.

b. UNDEVELOPED

Component No.	Component Activity for Alternative 2	Effect Rating
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. Multiple rotenone applications would be necessary over the course of several years. Locate detox station approximately 160-170 meters upstream of Arrow Lake. 	No effect

Component No.	Component Activity for Alternative 2	Effect Rating
2	<ul style="list-style-type: none"> The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season. 	No effect
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout may not be possible. 	Negative effect
4	Personnel would hike to the project area.	No effect
5	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake. 	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Negative effect
	Total number of positive and negative effects	Zero positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	minus 4

Explain: Streamside incubators, remote monitoring stations, and fish markers would negatively affect the undeveloped quality, since these devices would be installations. The construction of a new trail from Camas Lake to Lake Evangeline and a spur trail above Arrow Lake would also negatively affect this quality.

c. NATURAL CONDITION

Component No.	Component Activity for Alternative 2	Effect Rating
1	<ul style="list-style-type: none"> Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. Multiple rotenone applications would be necessary over the course of several years. Locate detox station approximately 160-170 meters upstream of Arrow Lake. 	Positive and negative effect

Component No.	Component Activity for Alternative 2	Effect Rating
2	<ul style="list-style-type: none"> The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season. 	No effect
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout may not be possible. 	Positive and negative effect
4	Personnel would hike to the project area.	No effect
5	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake. 	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect
	Total number of positive and negative effects	3 positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	zero

Explain: The removal of non-native fish under this alternative would benefit the natural condition. The degree of benefit would be questionable, however, since it may not be possible to remove a sufficient number of Yellowstone cutthroat trout. If a sufficient number cannot be removed, effects to the natural condition would be negative, since there would be enough surviving individuals to present a continued hybridization risk to native westslope cutthroat trout populations downstream.

The time required to remove non-native Yellowstone cutthroat trout would also delay translocation, which would have indirect negative effects to the natural condition by delaying the protection of westslope cutthroat trout and bull trout from ongoing risks associated with non-native fish and climate change. If native westslope cutthroat trout cannot be translocated, they would not be protected from these threats. Native fish could also be injured during transport to and from the project area due to jostling and the time spent in carriers.

This alternative would have additional, long-term negative effects to the natural condition from the mortality of amphibians and aquatic invertebrates. Because multiple applications of rotenone would be necessary, amphibian and aquatic insect population sizes and species distribution would be reduced and may not recover for several years or may be permanently affected. Locating the detox site near Arrow

Lake would also negatively affect the natural condition, since rotenone may not be fully neutralized before reaching native fish populations in the lake, causing mortality of native fish.

There would also be negative effects to this quality from the construction of two new trails, which would remove vegetation, compact soils, and reduce wildlife security by enabling human access for several years after the conclusion of the project.

Monitoring translocated fish would benefit the natural condition by providing data necessary to evaluate the success of the project, and inform native fisheries conservation elsewhere in the park.

d. SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component No.	Component Activity for Alternative 2	Effect Rating
1	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. • Multiple rotenone applications would be necessary over the course of several years. • Locate detox station approximately 160-170 meters upstream of Arrow Lake. 	Negative effect
2	<ul style="list-style-type: none"> • The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. • Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season. 	Negative effect
3	<ul style="list-style-type: none"> • Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for several years. • Translocation of westslope cutthroat trout may not be possible. 	No effect
4	Personnel would hike to the project area.	No effect
5	<ul style="list-style-type: none"> • Transport equipment with packstock and on foot. • Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake. 	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects 3 negative effects

Component No.	Component Activity for Alternative 2	Effect Rating
	Effect Rating (sum of positive and negative effects)	minus 3

Explain: Multiple rotenone applications over the years and a frequent presence of project personnel would result in a prolonged potential for disrupted solitude. Frequent area closures during rotenone application would restrict unconfined recreation for weeks or months at a time over the course of several years. The construction of two new trails would negatively affect solitude, because it would enable human access into the area for years after the conclusion of the project. Trails also negatively affect unconfined recreation because they direct or “confine” visitors to the trail.

e. OTHER FEATURES OF VALUE

Component No.	Component Activity for Alternative 2	Effect Rating
1	<ul style="list-style-type: none"> • Use rotenone to remove non-native Yellowstone cutthroat trout, followed by application of detoxifying agent, using non-motorized methods. • Multiple rotenone applications would be necessary over the course of several years. • Locate detox station approximately 160-170 meters upstream of Arrow Lake. 	Positive and negative effect
2	<ul style="list-style-type: none"> • The area would be closed to public access from the foot of Arrow Lake to Ruger Lake from late spring/early summer until the following spring over the course of multiple years. • Arrow Lake and Camas Lake backcountry campgrounds would be occupied by personnel and closed to the public for much of the season. 	Negative effect
3	<ul style="list-style-type: none"> • Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for several years. • Translocation of westslope cutthroat trout may not be possible. 	Positive and negative effect
4	Personnel would hike to the project area.	No effect
5	<ul style="list-style-type: none"> • Transport equipment with packstock and on foot. • Construct a trail from the foot of Camas Lake to Lake Evangeline, and a spur trail from the Camas Creek Trail to the detox station above the head of Arrow Lake. 	No effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect

Component No.	Component Activity for Alternative 2	Effect Rating
	Total number of positive and negative effects	3 positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	zero

Explain: As one means of conserving and managing native fish, this alternative would confer some benefit to scientific and educational values represented by aquatic ecosystems. However, because multiple applications of rotenone would cause the long term and possibly permanent decline in amphibian and aquatic insect populations, and because the location of the detox station would risk the mortality of native fish, this alternative would also negatively affect those scientific and educational values. Scientific values would also be negatively affected if translocation of westslope cutthroat trout is not possible, since a conservation research opportunity would be lost.

Prohibiting the public from entering the treatment area for weeks at a time over the course of multiple seasons would also negatively affect educational values by preventing opportunities to experience and learn from the area. Marking and tracking translocated fish would benefit scientific values because it would provide data on fish movement and the success of the project, and because the information gained could inform fisheries research and management elsewhere in the park.

Nighttime work lights would negatively impact scenic values.

Summary of effects rating for Alternative 2

Untrammelled: minus 3

Undeveloped: minus 3

Natural: zero

Solitude or Primitive & Unconfined Recreation: minus 3

Other Features of Value: zero

Summary Rating: minus 9

Alternative 3

Remove non-native Yellowstone cutthroat trout using mechanical methods, translocate native fish, include motorized support and helicopters.

Description:

Remove Yellowstone cutthroat trout

Non-native Yellowstone cutthroat trout would be removed using electrofishing, angling, netting and trapping. Gill nets and/or trap nets would be deployed at Lake Evangeline and Camas Lake with the assistance of motorboats, mechanical/motorized net pullers, generators, and other motorized equipment. Individual fish would be tagged and tracked (e.g. radio-telemetry) as they move around the lake to identify spawning or juvenile rearing sites, or other areas where they congregate in large numbers. Nets would be deployed at these sites to remove as many Yellowstone cutthroat as possible. Work lights would be necessary during nighttime operations for the safety of personnel. Motorboats would be stored on site; a ramp and/or temporary shelter may need to be constructed to protect the boats during winter.

Gill netting rarely achieves complete removal of the target fish population, and is generally more useful for suppressing non-native fish numbers (i.e. reducing them such that they pose a decreased threat to native species but are not necessarily eliminated). To have any chance of removing a sufficient number of the Yellowstone cutthroat trout population in the upper Camas drainage, gill netting the lakes from motorboats would need to be underway as early in the spring and as late in the fall as possible (i.e. as soon as crews can access the lakes and until winter weather prohibits access or operations) for at least five years, if not longer. Electrofishing and angling the stream would need to be underway for similar periods of time, and possibly also during winter months for any meaningful reduction in Yellowstone cutthroat trout. Even with intensive removal efforts every year for multiple years, it is possible that a sufficient number of Yellowstone cutthroat trout could not be removed. Therefore, following the first few years of intensive removal, punctuated removal efforts every few years using the same methods just described would likely be necessary for the foreseeable future.

An estimated 15-20 or more project personnel would be in the project area during removal operations. Personnel would likely use the backcountry campgrounds at Camas and/or Arrow Lakes and would also camp at Lake Evangeline. There would be no area closures (i.e. the area would remain open to public access) during mechanical fish removal, but both campgrounds would likely be unavailable since they would be occupied by project personnel (each campground has capacity for 8 people, with a combined capacity of 16).

Translocation of native fish

Bull trout would be translocated into Lake Evangeline and Camas Lake. Westslope cutthroat trout would be translocated to the lakes only if enough Yellowstone cutthroat trout are removed to enable the successful establishment of a new westslope cutthroat population in the upper Camas drainage. Translocation methods would be as described for Alternative 1, including the use of helicopters (i.e. juvenile fish would be directly released into the lakes from helicopter tanks, released from coolers or other containers from shore, moved directly to the lakes without hatchery propagation, or reared naturally in stream-side incubators in the new habitat).

Given the amount of time it would take to remove non-native Yellowstone cutthroat trout from project waters, translocation under this Alternative would likely not begin for at least five years, possibly longer. Translocated fish would be monitored, which could require marking them with tags, fin clips, or other means and tracking them using fixed-location remote stations.

Project transportation needs

Project personnel would hike to the project area for all phases of the project. Helicopters would be necessary to transport boats, generators, and possibly other equipment. Helicopters would also be used to transport fish and fish eggs during native fish translocation.

Component Activities for Alternative 3

How will each of the components of the action be performed under this alternative?

Component No.	Component Description	Component Activity for Alternative 3
1	Removal of non-native Yellowstone cutthroat trout	<ul style="list-style-type: none">• Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever).• Removal efforts would be necessary for at least 5 years or more.• Construction of a boat ramp and/or shelter would be necessary.
2	Closure of treatment area	<ul style="list-style-type: none">• The treatment area would remain open to the public (i.e. no area closures).• Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years.
3	Translocation of native westslope cutthroat trout and bull trout	<ul style="list-style-type: none">• Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers).• Translocation would not begin for at least 5 years or more.• Translocation of westslope cutthroat trout may not be possible.
4	Transport of personnel to the project area	Personnel would hike to the project area.
5	Transport of equipment to the project area	Transport equipment with packstock and helicopters.
6	Monitoring results	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.

Effects to Wilderness Character from Alternative 3

What is the effect of each component activity for Alternative 3 on the qualities of wilderness character?

a. UNTRAMMELED

Component No.	Component Activity for Alternative 3	Effect Rating
1	<ul style="list-style-type: none"> Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever). Removal efforts would be necessary for at least 5 years or more. Construction of a boat ramp and/or shelter would be necessary. 	Negative effect
2	<ul style="list-style-type: none"> The treatment area would remain open to the public (i.e. no area closures). Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years. 	No effect
3	<ul style="list-style-type: none"> Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for at least 5 years or more. <p>Translocation of westslope cutthroat trout may not be possible.</p>	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	No effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects 2 negative effects
	Effect Rating (sum of positive and negative effects)	minus 2

Explain: The removal of Yellowstone cutthroat trout and the translocation of native fish would negatively affect the untrammeled quality of wilderness character, since these actions would intentionally manipulate the biophysical environment.

b. UNDEVELOPED

Component No.	Component Activity for Alternative 3	Effect Rating
1	<ul style="list-style-type: none"> • Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever). • Removal efforts would be necessary for at least 5 years or more. • Construction of a boat ramp and/or shelter would be necessary. 	Negative effect
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years. 	No effect
3	<ul style="list-style-type: none"> • Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for at least 5 years or more. <p>Translocation of westslope cutthroat trout may not be possible.</p>	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Negative effect
	Total number of positive and negative effects	Zero positive effects 4 negative effects
	Effect Rating (sum of positive and negative effects)	minus 4

Explain: The use of motorboats, motorized equipment, and helicopters would negatively affect the undeveloped quality. Streamside incubators, fish tracking markers, and remote sensors would also negatively affect this quality, since these devices would be installations. The undeveloped quality would be further impacted if a boat ramp and/or shelter are constructed.

c. NATURAL CONDITION

Component No.	Component Activity for Alternative 3	Effect Rating
1	<ul style="list-style-type: none"> • Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever). • Removal efforts would be necessary for at least 5 years or more. • Construction of a boat ramp and/or shelter would be necessary. 	Positive and negative effect
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years. 	No effect
3	<ul style="list-style-type: none"> • Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for at least 5 years or more. <p>Translocation of westslope cutthroat trout may not be possible.</p>	Positive and negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect
	Total number of positive and negative effects	3 positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	zero

Explain: This alternative would bring some benefit to the natural condition through the removal of non-native Yellowstone cutthroat trout. But as with Alternative 2, it may not be possible to remove a sufficient number. This is especially the case for Lake Evangeline, given the size of the lake (72.23 acres). Effects to the natural condition would be negative if a sufficient number of Yellowstone cutthroat trout cannot be removed, since hybridization risks to downstream native westslope cutthroat trout populations would continue.

The time required to remove non-native Yellowstone cutthroat trout would also delay translocation, which would have indirect negative effects to the natural condition by delaying the protection of westslope cutthroat trout and bull trout from ongoing risks associated with non-native fish and climate

change. If westslope cutthroat trout cannot be translocated, they would not be protected from these risks.

This alternative would also have temporary negative effects to the natural condition due to noise from helicopters and other motorized equipment during project implementation. Monitoring would benefit the natural condition because it would provide data necessary to evaluate the success of the project, and may inform other native fisheries conservation efforts.

d. SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component No.	Component Activity for Alternative 3	Effect Rating
1	<ul style="list-style-type: none"> Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever). Removal efforts would be necessary for at least 5 years or more. Construction of a boat ramp and/or shelter would be necessary. 	Negative effects
2	<ul style="list-style-type: none"> The treatment area would remain open to the public (i.e. no area closures). Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years. 	No effect
3	<ul style="list-style-type: none"> Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for at least 5 years or more. <p>Translocation of westslope cutthroat trout may not be possible.</p>	Negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	No effect
	Total number of positive and negative effects	Zero positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	minus 3

Explain: Opportunities for solitude would be negatively affected by noise from helicopters and other motorized equipment, and from the prolonged presence of personnel in the project area.

The unavailability of the campsites would have no effects, because preserving this quality is not dependent on designated campgrounds (designated camping has negative effects to this quality because they restrict unconfined recreation).

e. OTHER FEATURES OF VALUE

Component No.	Component Activity for Alternative 3	Effect Rating
1	<ul style="list-style-type: none"> • Use angling, electrofishing, and gill or trap netting to remove non-native Yellowstone cutthroat trout with the assistance of motorboats and other motorized equipment (e.g. generator, mechanical net retriever). • Removal efforts would be necessary for at least 5 years or more. • Construction of a boat ramp and/or shelter would be necessary. 	Positive and negative effect
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public for much of the summer season for multiple years. 	No effect
3	<ul style="list-style-type: none"> • Native fish would be translocated using helicopters as well as non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for at least 5 years or more. <p>Translocation of westslope cutthroat trout may not be possible.</p>	Positive and negative effect
4	Personnel would hike to the project area.	No effect
5	Transport equipment with packstock and helicopters.	Negative effect
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	Positive effect
	Total number of positive and negative effects	3 positive effects 3 negative effects
	Effect Rating (sum of positive and negative effects)	zero

Explain: Through the removal of non-native fish, Alternative 3 would benefit scientific and educational values represented by aquatic systems. But the degree of benefit would depend on the degree to which non-native Yellowstone cutthroat trout could be removed. Scientific values would also be negatively affected if translocation of westslope cutthroat trout is not possible, since a conservation research opportunity would be lost.

This alternative would adversely impact scenic values due to the visible presence of motorboats, nighttime work lights, and possible boat ramp and/or shelter, with effects potentially lasting for several years. Helicopter flights would affect scenic values along the flight path.

Marking and tracking translocated fish would benefit scientific values because it would provide data on fish movement and the success of the project, and because the information gained could inform fisheries research and management elsewhere in the park.

Summary of effects rating for Alternative 3

Untrammeled: minus 2

Undeveloped: minus 4

Natural: zero

Solitude or Primitive & Unconfined Recreation: minus 3

Other Features of Value: zero

Summary Rating: minus 9

Alternative 4

Remove non-native Yellowstone cutthroat trout using mechanical methods, translocate native fish, no motorized support and helicopters

Description:

Remove Yellowstone cutthroat trout

Non-native Yellowstone cutthroat trout would be removed using exclusively non-motorized methods, i.e. electrofishing, angling, trapping, and gill netting the lakes from hand-propelled watercraft. As described for gill netting under Alternative 3, individual fish would be tagged and tracked, and nets would be deployed where the fish congregate to remove as many Yellowstone cutthroat as possible. During nighttime operations, work lights would be necessary for the safety of personnel.

Non-motorized mechanical methods such as those just described have been successful in removing non-native fish from small lakes and short reaches of stream elsewhere (Knapp et al. 2007; Pacas and Taylor 2015; and Vredenburg 2004). For example, in Banff National Park, non-native brook trout were successfully removed from a 57.1-acre lake (23.1-hectares), a 23.9-acres lake (9.7-hectares), and a 2.8-mile (4.5-kilometer) downstream stretch of river using electrofishing and gill nets deployed from a rowboat (Pacas and Taylor 2015). Similarly, Shepard et al. (2002) removed brook trout using backpack electrofishing from a relatively short, small, and simplified (through riparian vegetation removal) stream in Montana to benefit westslope cutthroat trout. These efforts required year-round (including wintertime) net sets and/or electrofishing for five to eight years (Pacas and Taylor 2015; Shepard et al. 2002). Based on these studies, year-round removal operations over a similar amount of time would be required to successfully remove Yellowstone cutthroat trout from Camas Lake (17.5 acres) and Camas Creek above Arrow Lake (estimated 3 miles of stream). Nets would be left unattended at the lakes during wintertime. The amount of time required to remove Yellowstone cutthroat trout from Lake Evangeline would likely twice or three times longer, given the lake's size (72.2 acres); there is also a very real likelihood that Yellowstone cutthroat trout could never be removed from Lake Evangeline, since reproduction could out-pace removal, and removal efforts could well be necessary for the foreseeable future.

An estimated 15-20 or more project personnel would be in the project area during non-motorized removal operations. There would be no area closures, but the backcountry campgrounds at both Arrow

and Camas Lakes would likely be unavailable since they would be occupied by project personnel (each campground has capacity for 8 people, with a combined capacity of 16). Personnel would also camp at Lake Evangeline.

Translocation of native fish

Bull trout would be translocated into Lake Evangeline and Camas Lake. Westslope cutthroat trout would likely not be translocated, since non-native Yellowstone cutthroat trout would not likely be sufficiently removed, especially from Lake Evangeline. (Translocation of bull trout would still be possible, because non-native Yellowstone cutthroat trout do not present hybridization, predation, or competition risks to bull trout.) Translocation methods would be as described for Alternative 1, except helicopters would not be used to transport the fish. Translocated fish would be monitored, which could require marking them with tags, fin clips, or other means and tracking them using fixed-location remote stations.

Project transportation needs

Project personnel would hike to the project area. All equipment and fish would be transported on foot or with packstock. Since the Camas Creek Trail ends at the foot of Camas Lake, and due to the amount of equipment that would need to be packed in (requiring multiple trips with stock) and the difficulty of the terrain, a trail would need to be constructed from the foot of Camas Lake to Lake Evangeline.

References:

Knapp, R. A., D. M. Boiano, and V. T. Vredenburg. 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*). *Biological Conservation*, 35:11–20.

Pacas, C. and M.K. Taylor. 2015. Nonfish toxicant eradication of an introduced brook trout from a headwater complex in Banff National Park, Canada. *North American Journal of Fisheries Management* 35:748–754.

Shepard, B.B., R. Spoon, and L. Nelson. 2002. A native westslope cutthroat trout population responds positively after brook trout removal and habitat restoration. *Intermountain Journal of Science* 8:191–211.

Vredenburg, V. T. 2004. Removal of brook and rainbow trout from small lakes less than 15 acres in Kings Canyon National Park using gill nets only: Reversing introduced species effects: experimental removal of introduced fish leads to rapid recovery of a declining frog. *Proceedings of the National Academy of Sciences of the USA* 100:4646–7650.

Component Activities for Alternative 4

How will each of the components of the action be performed under this alternative?

Component No.	Component Description	Component Activity for Alternative 4
1	Removal of non-native Yellowstone cutthroat trout	<ul style="list-style-type: none"> • Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. • Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline.
2	Closure of treatment area	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years.

Component No.	Component Description	Component Activity for Alternative 4
3	Translocation of native westslope cutthroat trout and bull trout	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout would likely be impossible.
4	Transport of personnel to the project area	Personnel would hike to the project area.
5	Transport of equipment to the project area	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline.
6	Monitoring results	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.

Effects to Wilderness Character from Alternative 4

What is the effect of each component activity on the qualities of wilderness character?

a. UNTRAMMELED

Component No.	Component Activity for Alternative 4	Effect Rating
1	<ul style="list-style-type: none"> Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline. 	
2	<ul style="list-style-type: none"> The treatment area would remain open to the public (i.e. no area closures). Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years. 	
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout would likely be impossible. 	

Component No.	Component Activity for Alternative 4	Effect Rating
4	Personnel would hike to the project area.	
5	<ul style="list-style-type: none"> • Transport equipment with packstock and on foot. • Construct a trail from the foot of Camas Lake to Lake Evangeline. 	
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	
	Total number of positive and negative effects	
	Effect Rating (sum of positive and negative effects)	

Explain: The untrammeled quality of wilderness character would be negatively affected by the removal of Yellowstone cutthroat trout and translocation of native fish, since these actions would intentionally manipulate the biophysical environment. The construction of a trail would result in an indirect manipulation of the biophysical environment (altering vegetation, soils, and habitat), which would also negatively affect the untrammeled quality.

b. UNDEVELOPED

Component No.	Component Activity for Alternative 4	Effect Rating
1	<ul style="list-style-type: none"> • Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. • Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline. 	
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years. 	
3	<ul style="list-style-type: none"> • Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for several years. • Translocation of westslope cutthroat trout would likely be impossible. 	
4	Personnel would hike to the project area.	

Component No.	Component Activity for Alternative 4	Effect Rating
5	<ul style="list-style-type: none"> • Transport equipment with packstock and on foot. • Construct a trail from the foot of Camas Lake to Lake Evangeline. 	
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	
	Total number of positive and negative effects	
	Effect Rating (sum of positive and negative effects)	

Explain: Streamside incubators, remote monitoring stations, and fish markers would negatively affect the undeveloped quality, since these devices would be installations. The construction of a new trail from Camas Lake to Lake Evangeline would also negatively affect this quality.

c. NATURAL

Component No.	Component Activity for Alternative 4	Effect Rating
1	<ul style="list-style-type: none"> • Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. • Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline. 	
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years. 	
3	<ul style="list-style-type: none"> • Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). • Translocation would not begin for several years. • Translocation of westslope cutthroat trout would likely be impossible. 	
4	Personnel would hike to the project area.	
5	<ul style="list-style-type: none"> • Transport equipment with packstock and on foot. • Construct a trail from the foot of Camas Lake to Lake Evangeline. 	

Component No.	Component Activity for Alternative 4	Effect Rating
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	
	Total number of positive and negative effects	
	Effect Rating (sum of positive and negative effects)	

Explain: There would be some benefit to the natural condition through the removal of some non-native Yellowstone cutthroat trout. But effects would also be negative since many Yellowstone cutthroat trout would likely remain, perpetuating hybridization risks to downstream native westslope cutthroat trout populations. This would be especially likely for Lake Evangeline. This alternative would also have negative effects to the natural condition from the year-round deployment of nets, especially in winter when the nets would be unattended, which would put terrestrial animals that prey on aquatic organisms at an increased risk of mortality.

The time required to remove non-native Yellowstone cutthroat trout (years) would delay translocation, and it is likely that westslope cutthroat trout would not be translocated. This would have indirect negative effects to the natural condition by delaying the protection of bull trout from ongoing risks associated with non-native fish and climate change, and would altogether forego similar conservation opportunities for westslope cutthroat trout. Bull trout could also be injured during transport to and from the project area due to jostling and the time spent in carriers.

There would also be negative effects to this quality from the construction of a new trail between Camas and Ruger Lakes, since construction would remove vegetation, compact soils, and reduce wildlife security by enabling human access for several years.

Monitoring would benefit the natural condition because it would provide data that would inform managers as to the success of the project, and be used for other native fisheries conservation efforts.

d. SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component No.	Component Activity for Alternative 4	Effect Rating
1	<ul style="list-style-type: none"> • Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. • Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline. 	
2	<ul style="list-style-type: none"> • The treatment area would remain open to the public (i.e. no area closures). • Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years. 	

Component No.	Component Activity for Alternative 4	Effect Rating
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout would likely be impossible. 	
4	Personnel would hike to the project area.	
5	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline. 	
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	
	Total number of positive and negative effects	
	Effect Rating (sum of positive and negative effects)	

Explain: The frequent and prolonged presence of personnel for multiple years would negatively impact solitude. The unavailability of the campsites would have no effects, because preserving this quality is not dependent on designated campgrounds (designated camping has negative effects to this quality because they restrict unconfined recreation).

The construction of a new trail would negatively affect solitude, because it would enable human access into the area for years after the conclusion of the project. Trails also negatively affect unconfined recreation because they direct or “confine” visitors to the trail.

e. OTHER FEATURES OF VALUE

Component No.	Component Activity for Alternative 4	Effect Rating
1	<ul style="list-style-type: none"> Use non-motorized methods, i.e. angling, electrofishing, traps, and gill netting from hand-propelled watercraft to remove non-native Yellowstone cutthroat trout. Removal efforts would be necessary year-round for 5-8 years or more, or for the foreseeable future on Lake Evangeline. 	
2	<ul style="list-style-type: none"> The treatment area would remain open to the public (i.e. no area closures). Backcountry campgrounds at Camas and Arrow Lakes would be occupied by personnel and unavailable to the public during much of the year for multiple years. 	

Component No.	Component Activity for Alternative 4	Effect Rating
3	<ul style="list-style-type: none"> Native fish would be translocated using non-motorized methods (e.g. streamside incubators, hand-carried containers). Translocation would not begin for several years. Translocation of westslope cutthroat trout would likely be impossible. 	
4	Personnel would hike to the project area.	
5	<ul style="list-style-type: none"> Transport equipment with packstock and on foot. Construct a trail from the foot of Camas Lake to Lake Evangeline. 	
6	Mark translocated fish with tags, fin clips, or other means and track them using fixed-location remote stations.	
	Total number of positive and negative effects	
	Effect Rating (sum of positive and negative effects)	

Explain: Through the removal of non-native fish, this alternative would benefit scientific and educational values represented by aquatic systems. The degree of benefit would be questionable, however, since a sufficient number of non-native Yellowstone cutthroat trout may never be removed from the system. Scientific values would also be negatively affected since translocation of westslope cutthroat trout would likely be impossible, resulting in a lost conservation research opportunity.

This alternative would adversely impact scenic values due to the visible presence of boats and other equipment as well as nighttime work lights, with effects potentially lasting for several years.

Marking and tracking translocated fish would benefit scientific values because it would provide data on fish movement and evaluate the success of the project, and because the information gained could inform fisheries research elsewhere in the park.

Summary: number of negative and positive effects to wilderness character for Alternative 4

Untrammeled: minus 3

Undeveloped: minus 3

Natural: zero

Solitude or Primitive & Unconfined Recreation: minus 2

Other Features of Value: plus 1

Summary Rating: minus 7

Alternatives Not Analyzed

What alternatives were considered but not analyzed? Why were they not analyzed?

- 1) **No action.** A no-action alternative was not analyzed in this MRDG because it would not meet the need for action identified in Step 1 of this MRDG. A no-action alternative was analyzed in detail in the environmental assessment (EA) for the project.
- 2) **Remove non-native Yellowstone cutthroat trout without translocating native fish.** An alternative to remove the Yellowstone cutthroat trout and allow native fish to migrate into the upper drainage without translocation was not analyzed because the upper drainage is inaccessible to fish due to several waterfalls.
- 3) **Translocate native fish without removing non-native Yellowstone cutthroat trout.** This alternative was not analyzed because it would not reduce the risk of hybridization to westslope cutthroat trout in the Camas drainage of hybridization, and because translocated fish would not be capable of establishing populations if non-native Yellowstone cutthroat trout are in the system at current numbers. This alternative, therefore, would not meet the need for action identified in Step 1 of this MRDG.
- 4) **Use recreational angling only to remove non-native fish.** This alternative was considered but dismissed in the EA process because previous creel surveys and angler use information indicate that there is not sufficient fishing activity in the Camas drainage for recreational anglers to achieve sufficient removal of Yellowstone cutthroat trout from the project area. This approach has been tried in previous areas without success (see EA, Appendix C). Therefore, this alternative would not meet the need for action identified in Step 1 of this MRDG.
- 5) **Monitor translocated fish without installations (i.e. tags and fixed-location remote stations).** This alternative component was dismissed because monitoring without the use of remote detection technology would require marking fish by clipping fins then angling, electrofishing, netting, or trapping to try to recapture the marked fish. This approach would not produce reliable results on fish movements or the outcome of translocation due to the high probability that marked fish would never be recaptured. Therefore, there would be no reliable measurement of whether the need for action outlined in Step 1 of this MRDG has been met.
- 6) **Use electric trolling motors for the boats instead of gas-powered outboard motors.** This alternative component was considered in the EA as a means of reducing impacts to natural soundscapes and wilderness character. It was dismissed, however, because the battery life of electric trolling motors would not be sufficient for the estimated two to three days necessary to apply the rotenone, and there would not be a way to rapidly recharge the batteries due to the remote location. Electric trolling motors have, therefore, been dismissed because they would not be feasible.

Alternative Comparison

Summary of positive and negative effects to wilderness character from each alternative:

Alternative 1: 6 positive and 15 negative effects, for a total of 9 negative effects (rating of minus 9)

Alternative 2: 6 positive and 15 negative effects, for a total 9 negative effects (rating of minus 9)

Alternative 3: 6 positive and 15 negative effects, for a total of 9 negative effects (rating of minus 9)

Alternative 4: 6 positive and 13 negative, for a total of 7 negative effects (rating of minus 7)

Selected Alternative

The selected alternative is Alternative 1, Remove non-native Yellowstone cutthroat trout using rotenone and translocate native fish, include motorized support and helicopters.

Rationale for the selection

While the number of effects to wilderness character are fairly similar for all four alternatives, lowest total scores for Alternative 4 at first suggest that non-motorized mechanical methods for removing non-native Yellowstone cutthroat trout would best preserve wilderness character. But Alternative 4 does not provide the best chance of successfully meeting the need for action identified in Step 1 of this MRDG; nor do Alternatives 2 and 3. The selection of Alternative 1 is based on project effectiveness and minimizing the intensity and degree of negative impacts to park resources, including wilderness character. Alternative 1 provides the best chance of successfully removing non-native Yellowstone cutthroat trout and reducing or eliminating the threat they pose to downstream native westslope cutthroat trout populations. Alternative 1 achieves this by using rotenone, which is capable of removing fish at the population scale in a matter of days, and by using equipment that will enable the fastest and most thorough distribution of the rotenone. Because Alternative 1 is the most effective approach for removing non-native Yellowstone trout, it is also most likely to enable the establishment of secure habitat for westslope cutthroat trout and bull trout in the upper Camas drainage.

Alternative 1 will have the lowest intensity and shortest duration of impacts to park resources. Rotenone can be applied in an estimated two to three days (which includes the operation of motorboats), and detoxification can be accomplished in approximately two to three weeks. Impacts to wilderness character, natural soundscapes, visitors, and wildlife from disturbance and noise from motorized use will, therefore, only occur for about three to four weeks during the fish removal portion of the project. After that, there will be some follow up noise from helicopter operations during native fish translocation, but this will be punctuated and very infrequent (estimated at four flights per year over the course of six to seven years). Alternative 3, in comparison, would involve the use of motorboats during spring, summer, and fall for multiple years. The amount of time project personnel would need to be in the area is considerably less under Alternative 1 than under Alternatives 2, 3, and 4. Alternative 1 will result in less trampling of vegetation, including sensitive wetland species, less compaction of soil, less potential for social trail development, and less disturbance to wildlife and visitors. Alternatives 2, 3, and 4, by comparison, would require personnel to be in the area for prolonged periods of time over the course of multiple years, if not indefinitely. Compared with Alternatives 2 and 4, Alternative 1 would also not require the construction of a new trail between Camas and Ruger Lakes. The construction of the trail under the non-motorized Alternatives 2 and 4 and the spur trail under Alternative 2 would cause long-term if not permanent negative impacts to vegetation and soils, would enable human access into an area heavily used by grizzly bears, and would result in an ongoing risk of human-caused disturbance to other wildlife species as well. The trails would negatively affect the area's undeveloped quality for the long-term, and would expand potential impacts to solitude into a currently trail-less area.

There is also no need to build a boat ramp or shelter under Alternative 1, since the boats will not be in operation long enough to require a ramp, nor will they be onsite long enough to require a shelter (even if they must be cached onsite for a single winter in preparation for reapplication the following season). In comparison, Alternative 3 would require the use of motorboats over the course of several months per year for years at a time, which would likely require a boat ramp and shelter.

Since Alternative 1 involves only one or two rotenone applications, amphibian and aquatic insect populations will be able to recover. Alternative 2, in comparison would impact these organisms over multiple applications, risking permanent decreases in amphibian and aquatic insect abundance and

distribution. Alternative 1 also allows placement of the detox station far enough upstream for the rotenone to be detoxified before reaching native fish populations in Arrow Lake. Since a non-motorized detox station under Alternative 2 would require placement of the detox station much closer to Arrow Lake, Alternative 2 would increase the risk of mortality to native fish populations.

Impacts to visitors from closures are also minimized under Alternative 1 compared with Alternative 2. Closure of the treatment area from the head of Arrow Lake to Ruger Lake under Alternative 1 will be in effect from the beginning of the project in late summer/early fall until spring. The Arrow Lake Backcountry Campground will only be closed during an estimated three to four weeks for implementation of the project (two to three days for rotenone application and two to three weeks for detoxification). The area closure under Alternative 2 would be in place for longer periods of time (much of the summer season) for multiple years, and would extend to the foot of Arrow Lake, requiring prolonged closure of the Arrow Lake backcountry campground.

Alternatives 2, 3, and 4 have not been selected because they would require considerably more time (years) to remove non-native Yellowstone cutthroat trout; likely fail to remove a sufficient number of non-native Yellowstone cutthroat trout to effectively reduce the hybridization risk to downstream westslope cutthroat trout; delay the translocation of native fish; and, especially in the case of Alternative 4, fail to enable the translocation of westslope cutthroat trout. These alternatives, therefore, do not meet the need for action identified in Step 1 of this MRDG. These alternatives would also have impacts to park resources that are of greater intensity and duration, primarily because each would take much longer to implement. The duration of impacts from personnel, and from noise in the case of Alternative 3, would be on the order of years, rather than weeks.

Monitoring and Reporting Requirements

Measures that will be taken to reduce impacts to recommended wilderness include the following. Additional mitigation measures will also be taken to minimize adverse impacts to other park resources, and are described in the EA.

- To minimize administrative flights over recommended wilderness, the park would make every effort to include helicopter flights for this project within the 50-flight limit on administrative flights. Flights would be considered with other proposed administrative flights, coordinated with other projects, and combined with other hauling needs whenever possible.
- A heavy lift helicopter would be used, pending availability, to carry as much heavy material as possible and reduce the number of flights. More efficient, lower noise models would be preferred.
- To minimize the duration of generator noise associated with rotenone detoxification, the detox site would be located as far downstream as possible to maximize the potential for rotenone to break down naturally through exposure to water movement and sunlight. This would reduce the detoxification time and, therefore, the duration of generator noise.

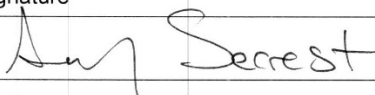
Boat motors and other motorized equipment would be selected for the lowest possible noise production while still using equipment that would meet project objectives.


Approvals

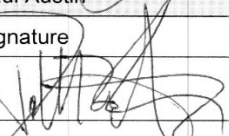
Which of the prohibited uses found in Section 4(c) of the Wilderness Act are approved in the selected alternative?


- Motorized equipment – generators and water pumps
- Motorboats – an estimated 2 boats
- Landing of aircraft – an estimated six to ten flights to bring materials and equipment to the project area, three to six flights to remove materials and equipment, and four flights per year for six or seven years for translocation

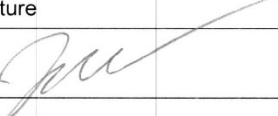
Prepared	Name	Position	
	Chris Downs	Fisheries Program Manager	
	Signature	Date	
	/s/ Chris Downs	4/24/2019	

Prepared	Name	Position	
	Amy Secrest	Environmental Compliance Specialist	
	Signature	Date	
		4/24/19	

Recommended	Name	Position	
	Brad Blickhan	Wilderness Coordinator	
	Signature	Date	
		4-24-19	

Recommended	Name	Position	
	Paul Austin	Chief, Visitor and Resources Protection	
	Signature	Date	
		4/25/19	

Recommended	Name	Position	
	Phil Wilson	Chief, Science and Resources Management	
	Signature	Date	
		4/24/19	

Approved	Name	Position	
	Jeff Mow	Superintendent	
	Signature	Date	
		4/24/19	