National Park Service
U.S. Department of the Interior
Glacier National Park
Waterton-Glacier International Peace Park
Montana

Akokala Creek Fish Passage Barrier Environmental Assessment

June, 2014

Akokala Lake, NPS photo.

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Environmental Assessment
Akokala Creek Fish Passage Barrier

Summary

Glacier National Park is proposing to build a fish passage barrier downstream of Akokala Lake in the park's North Fork District to protect native fish in the upper Akokala drainage. Akokala Lake is one of the last bull trout supporting lakes on the west side of the park that is at risk of invasion but has not yet been colonized by invasive non-native lake trout. The drainage is susceptible to invasion by non-native lake trout, rainbow trout, and possibly brook trout. Lake trout have already invaded nine of twelve accessible lakes on the west side of the park and are known to have severe detrimental effects on native fish populations. Rainbow trout are invading North Fork of the Flathead River tributaries and threaten westslope cutthroat trout populations with competition and hybridization. In the last few years, monitoring and genetic testing have shown that westslope cutthroat-rainbow trout hybridization is beginning to occur in Akokala Creek. Brook trout, which can outcompete westslope cutthroat trout and hybridize with bull trout, occur in tributaries of the Middle Fork of the Flathead River, and the potential exists for them to also invade Akokala Creek. A barrier would prevent additional non-native fish from accessing Akokala Lake and the uppermost Akokala drainage and reduce or eliminate further expansion of westslope cutthroat-rainbow trout hybridization. By protecting Akokala Lake against non-native invasive fish, this project would also help safeguard important habitat refugia for native fish confronting the potential stressors of climate change.

This environmental assessment (EA) evaluates two alternatives: a no action alternative and an action alternative. The no action alternative describes the current condition if a fish passage barrier was not built, and the action alternative addresses the proposed barrier.

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet the objectives of the proposal, 2) evaluates potential issues and impacts to Glacier National Park's resources, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics analyzed include fisheries and aquatic threatened and endangered species and species of concern, floodplains, recommended wilderness, and natural soundscapes. All other resource topics were dismissed because the project would result in negligible or minor effects to those resources or because the resource is not found in the analysis area and the resource would not be affected by the project. No major effects are anticipated as a result of this project. Public scoping was conducted in accordance with the NEPA, and the majority of the comments received were in support of the proposed project.

How to Comment— If you wish to comment on the EA, you may post comments online at **http://parkplanning.nps.gov/AkokalaFishBarrier** or mail or hand deliver comments to Superintendent, Glacier National Park, Attention: *Akokala Fish Barrier EA,* PO Box 128, West Glacier, Montana 59936. This environmental assessment will be on public review for 30 days. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

Table of Contents

List of Figures and Tables

Purpose and Need

The purpose of Glacier National Park is to:

- preserve and protect natural and cultural resources unimpaired for future generations (1916 Organic Act);
- provide opportunities to experience, understand, appreciate, and enjoy Glacier National Park consistent with the preservation of resources in a state of nature (1910 legislation establishing Glacier National Park); and
- celebrate the on-going peace, friendship, and goodwill among nations, recognizing the need for cooperation in a world of shared resources (1932 International Peace Park legislation).

The significance of Glacier National Park is explained relative to its natural and cultural heritage:

- Glacier's scenery dramatically illustrates an exceptionally long geological history and the many geological processes associated with mountain building and glaciation;
- Glacier offers relatively accessible, spectacular scenery and an increasingly rare primitive wilderness experience;
- Glacier is at the core of the "Crown of the Continent" ecosystem, one of the most ecologically intact areas remaining in the temperate regions of the world;
- Glacier's cultural resources chronicle the history of human activities (prehistoric people, Native Americans, early explorers, railroad development, and modern use and visitation) and show that people have long placed high value on the area's natural features; and
- Waterton-Glacier is the world's first international peace park.

Introduction

Glacier National Park is an approximately one million acre park in the Northern Rockies of northwestern Montana, along the United States-Canadian border. The park straddles the rugged mountains of the Continental Divide, and is at the center of the Crown of the Continent Ecosystem. The Crown of the Continent ecosystem encompasses approximately 28,000 square miles (72,000 square kilometers) of mountainous terrain between the southern regions of British Columbia and Alberta in Canada and the Blackfoot River south of Montana's Scapegoat Wilderness. Together with Canada's Waterton Lakes National Park, Glacier National Park forms the Waterton-Glacier International Peace Park, the world's first international peace park. The parks are listed together as a World Heritage Site and separately as International Biosphere Reserves. Outstanding natural and cultural resources are found in both parks. Glacier National Park's primary mission is the preservation of natural and cultural resources, ensuring that current and future generations have the opportunity to experience, enjoy, and understand the legacy of Waterton-Glacier International Peace Park.

Glacier National Park's pristine lakes and waterways are important strongholds for native fish species, including westslope cutthroat trout and the federally listed bull trout. The park's high elevation watersheds are also becoming increasingly important habitat refugia for bull trout and other native fish confronted with stressors from climate change. The invasion of several of the park's lake systems by non-native invasive fish species such as lake trout has put the long-term sustainability of native fish populations at risk. Protecting native fish resources is integral to the park's conservation and management programs (NPS 2006). Glacier National Park contains approximately one-third of the bull trout populations inhabiting natural, undammed lake systems in the United States (Fredenberg et al. 2007). The park therefore has a critical role in the recovery and long-term conservation of bull trout, not only within Glacier National Park, but on a regional scale. Akokala Lake, located in the backcountry of the park's North Fork District, supports both bull trout and westslope cutthroat trout, and has not yet been colonized by non-native lake trout. As a direct tributary of the North Fork of the Flathead River, however, the Akokala drainage is very susceptible to invasion, not only by non-native lake trout, but also by rainbow and possibly brook trout.

The action proposed in this environmental assessment (EA) is to construct a fish passage barrier downstream of Akokala Lake to protect bull trout and other native fish in the upper Akokala drainage. This EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality (CEQ) (40 CFR § 1508.9), and the National Park Service (NPS) Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

Background

Akokala Lake is a relatively small (22 acres) and shallow (23 feet deep) body of water in the backcountry of Glacier National Park's North Fork District. The lake supports bull trout, and genetic testing from 2008 suggests genetically pure westslope cutthroat trout are also present within the upper and lower Akokala drainage. Bull trout are federally listed as threatened, and westslope cutthroat trout are a state listed Species of Concern. Both bull and westslope cutthroat trout are native to the park, and bull trout in Akokala Lake are genetically distinct from other bull trout west of the Continental Divide.

Non-native lake trout began to appear in park waters west of the Continental Divide in the late 1950s and early 1960s via the Flathead River system, which forms the park's western and southern boundaries. Rainbow and brook trout are other recent invaders into the park's western waters. Of the seventeen lakes on the west side of the park that support bull trout, twelve are accessible to lake trout and nine have been invaded. Three are at risk of invasion because there are no physical barriers to preclude lake trout invasion, and one of those has already been invaded by brook trout. Akokala Lake is one of the last bull trout supporting lakes on the west side of the park that is at risk of invasion but has not yet been colonized by non-native lake trout. Such status is extremely rare, not only in Glacier National Park, but throughout the Flathead River drainage.

Non-native fish can affect native fish populations through predation, hybridization, and competition and are imperiling populations of bull trout. Lake trout are known to cause major adverse impacts to native fish populations, as has been documented in Kintla, Bowman, and Logging lakes in the North Fork of the Flathead River drainage, Lake McDonald, and numerous other lakes where lake trout have become established. In waters where they are introduced, lake trout generally replace bull trout as the dominant aquatic predator; competition and predation are the most likely mechanisms. Lake trout also live longer and spawn in lakes where they likely benefit from expansive juvenile rearing habitat. This gives them a reproductive advantage over bull trout and westslope cutthroat trout, which spawn in streams and tributaries where spawning and rearing habitat is generally more limited and is vulnerable to events such as flooding, fire, and drought.

Bull trout populations in some park lakes appear to be at imminent risk of functional extinction, which means their populations would no longer be self-sustaining and would not play a significant role in the ecosystem. Fredenberg (2003) concludes that in lakes of the Rocky Mountains, conversion of unique bull trout ecosystems to lake-trout dominated systems appears to be a common result once lake trout are established. Further, he contends that this transition may be rapid (20-30 years) even when habitat conditions remain relatively unaltered from the natural state. Data from Glacier National Park show that lake trout are increasing in abundance and bull trout are in decline; in park lakes where monitoring data exist, lake trout have replaced bull trout as the dominant aquatic predator (Downs et al. 2011). The colonization of several of the park's lakes by lake trout and the subsequent decline of bull trout in the park make protecting remaining bull trout populations a high priority.

Because the Akokala drainage is a direct tributary of the North Fork of the Flathead River, it is accessible to non-native fish and very susceptible to invasion, not only by non-native lake trout, but also by rainbow and possibly brook trout. Rainbow trout are invading North Fork of the Flathead tributaries both within and outside the park and threaten westslope cutthroat trout populations with competition and hybridization. In the past few years, a westslope cutthroat-rainbow trout hybrid was documented migrating into Akokala Creek during springtime (presumably to spawn) and genetic testing of juvenile westslope cutthroat trout in lower Akokala Creek has shown that westslope cutthroat-rainbow trout hybridization is beginning to occur in the drainage. While brook trout are not currently known to be present in the North Fork, the species occurs in tributaries of the Middle Fork of the Flathead River, and the potential exists for brook trout to invade the North Fork and its tributaries, including Akokala Creek. Brook trout can outcompete westslope cutthroat trout and hybridize with bull trout.

Given the number of lakes that have already been invaded, it is clear that Akokala Lake is at risk of invasion by non-native lake trout and increasing levels of hybridization between westslope cutthroat and rainbow trout; expanded invasion by rainbow trout appears especially imminent. Preliminary evidence suggests that habitat suitability in Akokala Lake is good for rainbow trout and marginal for lake trout (due in part to the lake's relatively shallow depth). But because the bull trout population at Akokala Lake is small (estimated at less than 30 reproducing adults), it could be readily impacted by lake trout migrating up the drainage, even without an established lake trout population.

Glacier National Park is also at high risk of critical habitat alteration from glacier and snow loss due to climate change. The most significant factors associated with climate warming likely to impact native trout populations in the western United States include changes in stream flow, warmer water, and the increasing frequency and intensity of disturbances such as rain-on-snow events in the fall and winter, altered precipitation patterns, and wildfire (Williams et al. 2009). These types of alterations to the park's ecological systems will compound existing stressors, such as impacts from invasive species, on already depressed bull trout populations. Bull trout require among the lowest water temperatures for optimal growth of any North American trout or salmon species (Selong et al. 2001). Many of the park's bull trout populations inhabit drainages where melting snowfields and glaciers support late season stream flow and cold water temperatures. While climate change impacts are difficult to predict, changes in habitat conditions such as alterations of water temperature and flow patterns, including mid-winter flooding of spawning areas, are expected and would likely adversely impact bull trout populations as well as other native fish, and ultimately favor non-native species such as lake trout and brook trout. For example, climate change appears to be accelerating the spread of hybridization between native westslope cutthroat trout and non-native rainbow trout in the Flathead River system, including lower Akokala Creek (Muhlfeld et al. 2014). The park's high elevation watersheds will provide important refugia for bull trout and other native fish from the stressors of climate change. Ensuring the availability of habitat that is free of lake trout, brook trout, and rainbow trout, as well as other aquatic invasive species (AIS) will be essential in maintaining this safeguard. The park is currently engaged in rigorous efforts to prevent AIS from invading park waters. (The zebra mussel, for example, would further reduce the availability of food in the park's already low-productivity waters.)

The *Action Plan to Conserve Bull Trout in Glacier National Park* (Fredenberg et al. 2007), developed by Montana State University and the U.S. Fish and Wildlife Service (USFWS) to conserve the long-term abundance, distribution and genetic diversity of bull trout in the park, identified Akokala Lake as among the highest priorities for consideration for placement of a fish

passage barrier. Because Akokala Lake supports westslope cutthroat trout and a genetically distinct population of bull trout, and because the lake appears to be free of non-native species, its conservation is critical. To protect native fish in the upper Akokala system, the park is proposing to build a fish passage barrier downstream of Akokala Lake; the barrier would be constructed at one of two possible locations that have been identified as most feasible. A fish passage barrier would prevent non-native invasive lake trout and brook trout as well as additional rainbow trout from accessing the uppermost drainage, and would reduce the expansion of westslope cutthroat-rainbow trout hybridization.

Purpose and Need

The purpose of this project is to protect native fish populations in the Akokala drainage from the severely detrimental, long-term effects of invasive non-native fish species. The project would meet the following objectives:

- Reduce the potential for non-native fish, including invasive lake trout and brook trout, to enter Akokala Lake and the upper Akokala drainage.
- Protect the integrity of native fish populations in the face of the potential added stressors associated with climate change.
- Protect a genetically distinct population of the threatened bull trout in the upper Akokala drainage, and thereby assist with bull trout conservation efforts on a regional scale.
- Protect the native westslope cutthroat trout population in Akokala Lake and the upper Akokala drainage from expanding hybridization with non-native rainbow trout.
- Conserve and maintain the natural condition of the park's recommended wilderness by protecting native fish populations and the ecological integrity of the backcountry lakes they inhabit.

Relationship to Other Plans and Policies

Current plans and policies that pertain to this proposal include the 2006 NPS *Management Policies*, Glacier National Park's *Resources Management Plan* (NPS 1993), the park's *General Management Plan* (GMP) (NPS 1999), the park's *Bear Management Plan* (NPS 2010), the *Large-Scale Removal of Lake Trout in Quartz Lake Environmental Assessment* (NPS 2009), and the *Quartz Creek Fish Barrier Modification and Improvement Environmental Assessment* (NPS 2012). Following is more information on how this proposal meets the goals and objectives of these plans and policies:

- The proposal is consistent with the NPS Organic Act of 1916, which established the National Park Service and the agency's purpose to "conserve the scenery and the natural and historic objects and the wild life therein" and to "leave them unimpaired" for future generations; and the enabling legislation for Glacier National Park, through which the park was established in part to "provide for the preservation of the park in a state of nature so far as is consistent with the purposes of this act, and for the care and protection of the fish and game within the boundaries thereof."
- The proposal is consistent with the goals and objectives of the 2006 *NPS Management Policies* which hold the NPS responsible for maintaining all animals native to the natural

ecosystems of parks, including fish, and for the reestablishment of "natural functions and processes", including the control of exotic species. Section 4.4.2.3 of the Management Policies direct the NPS to meet its responsibilities under the Endangered Species Act, and includes the control of "detrimental nonnative species".

- In keeping with Glacier National Park's 1993 *Resources Management Plan*, which gives the management and research of bull trout high priority, the fish barrier would protect a genetically distinct bull trout population and one of the last bull trout supporting lakes in the park that has not been colonized by non-native lake trout.
- The proposal would protect and maintain the integrity of native fish populations in the upper Akokala drainage and would therefore be compliant with the park's 1999 *General Management Plan*, which states that "management of natural resources in the backcountry zone would focus on protection and (when necessary) restoration of resources and natural processes".
- The implementation plan for the proposed project contains mitigation measures to minimize temporary impacts to bears, including strict storage requirements for food and other attractants, and would not permanently affect bears or bear habitat. The project is consistent with the objectives of the park's 2010 *Bear Management Plan*, which provides guidelines for the management of bears in the park.
- A fish passage barrier is in keeping with the objectives of the 2009 *Large-Scale Removal of Lake Trout in Quartz Lake Environmental Assessment,* which was also designed to protect native fish and control non-native invasive fish species.
- The proposed action is consistent with the 2012 *Quartz Creek Fish Barrier Modification and Improvement Environmental Assessment* in that both projects call for the protection of native fish populations and the control non-native invasive fish.

Identification of Impact Topics

The NPS takes a "hard look" at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. In the environmental consequences section of this EA, impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term or long-term. The intensity and type of impact is described as negligible, minor, moderate or major, and as beneficial or adverse. The NPS equates "major" effects as "significant" effects. The identification of "major" effects would trigger the need for an environmental impact statement (EIS). Where the intensity of an impact could be described quantitatively, numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by the NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this EA pertains to whether the NPS dismisses an impact topic from further detailed evaluation in the EA. The reason the NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

Impact Topics Retained for Further Analysis

Impact topics for this project were identified on the basis of federal laws, regulations, and orders; 2006 NPS *Management Policies*; and NPS knowledge of resources at Glacier National Park. Impact topics that are carried forward for further analysis in this EA include:

- **Fisheries, bull trout (threatened species under ESA), and westslope cutthroat trout**
- **Floodplains**
- **Recommended Wilderness**
- **Natural Soundscapes**

Impact Topics Dismissed from Further Analysis

This section provides a limited evaluation and explanation as to why the following impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation if:

- they do not exist in the analysis area, or
- they would not be affected by the proposal or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there would be minor or less effects (i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there would either be no contribution towards cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct and indirect, and cumulative effects is presented.

Wildlife

The NPS is charged with maintaining native wildlife as an integral component of natural ecosystems. Noise and human activity associated with construction of the proposed fish barrier could temporarily disturb individuals of some wildlife species. But the work would be localized to the barrier site, with few disturbances beyond the project area, and little habitat would be disturbed, especially for highly mobile and far ranging species such as large mammals. Species with more constrained ranges would not be measurably impacted since the proposed project would result in few alterations to wildlife habitat and most disturbances would be short-term. The project could result in the permanent removal of some trees with cavities, broken tops, or other features favored by wildlife such as woodpeckers and cavity nesting birds. Efforts would be made to avoid cutting standing dead or live trees with high wildlife value, and downed timber would be used whenever possible. Approximately 30 trees in total would be expected to supply the necessary logs for the project, and the probability that critical wildlife habitat would be measurably affected is low. The work would also occur in the late summer/fall (late August-October), when the critical nesting, denning, and young rearing periods are over for most species. Helicopter flights (approximately three are anticipated, with one or two flights expected on one or two days likely followed by a final flight on a subsequent day) could temporarily disturb wildlife beyond the project area and along the flight path. The project is expected to be completed within a four to five week period the first year with another possible one to two weeks of work the

following year; if work occurs during a second season, it too would occur during late summer/fall. Second year work would likely be at a similar level of activity and intensity as ongoing park-wide trail maintenance. Helicopter flights are not anticipated during second year work; if helicopter support is necessary, the potential for temporary disturbances to wildlife along the flight path would carry over to a second season. Infrequent future maintenance (possibly every seven to ten years) of the barrier should not require helicopter support and would have only negligible to minor impacts on wildlife. Overall, impacts to wildlife would be negligible to minor and are therefore dismissed from further analysis.

Federally Listed Species that have been dismissed from further analysis:

The NPS analyzes impacts to federally listed species in accordance with NEPA and the Endangered Species Act. Section 7 of the Endangered Species Act requires all federal agencies to consult with the USFWS to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, the 2006 *Management Policies* and Director's Order-77 *Natural Resources Management Guidelines* require the NPS to examine the impacts of projects on federal candidate species as well as state listed threatened, endangered, candidate, rare, declining, and sensitive species (NPS 2006).

Table 1: Federally listed species for Glacier National Park that have been dismissed from further analysis.

Species	Status
Grizzly bear (*Ursos arctos horribilis*)	Threatened
Canada lynx (*Lynx canadensis*)	Threatened
Spalding's catchfly (*Silence spaldingii*)	Threatened
Water howellia (*Howellia aquatilis*)	Threatened
Wolverine (*Gulo gulo*)	Proposed

Grizzly Bear (*Ursus arctos horribilis*). Federally listed as Threatened. Upper Akokala Creek is located within an area designated as Management Situation 1, where "management decisions will favor the needs of the grizzly bear when grizzly habitat and other land-use values compete and grizzly-human conflicts will be resolved in favor of grizzlies, unless the bear is determined to be a nuisance" (NPS 2010). Grizzly bears have been documented in the upper and lower Akokala drainage. Grizzly bear habitat modeling by the Cumulative Effects Model (CEM) Working Group indicates that grizzly bear habitat values along Akokala Creek in the vicinity of Akokala Lake are low during summer and autumn (CEM 2004, based on findings from Mace et al., 1999).

Individual bears travelling near the project area could be temporarily disturbed or displaced by noise and human activity during construction of the fish barrier. Helicopters delivering long-line sling loads to the barrier work site could temporarily disturb bears in the Akokala drainage. The duration of the disturbance would be temporary and of low frequency, with one or two flights

anticipated on one or two days, followed by a final flight on a subsequent day to haul out materials and equipment. Helicopters can elicit responses in bears ranging from head raises without displacement to increased physiological stress and temporary displacement, depending in part on the duration of the helicopter activity (Anderson et al., 2009). Flights would not occur during the grizzly bear denning season, and they would take place during the late summer or early fall when grizzly bear habitat values in the area are at their lowest and grizzly bears are more likely to be foraging at higher elevations. Helicopter support is not anticipated for second year work; if flights are necessary, temporary disturbances to grizzly bears along the flight path could occur.

While human activity in the project area and along the Akokala Lake Trail would temporarily increase during the barrier's construction, the work crew would be relatively small (estimated at six) and the duration of the increase would be short-term (approximately four to five weeks in the late summer/fall of the first year, with another possible one to two weeks of work the following year, also in the late summer/fall). If work is necessary the following year, it would likely be at a similar level of activity and intensity as ongoing park-wide trail maintenance. Increased human activity associated with the project would primarily be localized to the project area and strict measures would be in place to prevent grizzly bears from obtaining food rewards, thereby reducing the chances of grizzly-human conflicts. Infrequent future maintenance (possibly every seven to ten years) of the barrier should not require helicopter support and would have only negligible to minor impacts on grizzly bears. Overall, due to the short duration and low intensity of the project, impacts to grizzly bears would be minor. Impacts to grizzly bears are therefore not further analyzed. Under Section 7, the determination for grizzly bears would be "may affect, not likely to adversely affect", and a biological assessment has been prepared and submitted to the USFWS along with a copy of this EA.

Canada Lynx (*Lynx canadensis*). Federally listed as Threatened. There is potential lynx habitat within the Akokala drainage, but because much of the drainage burned between 1999 and 2007, the habitat is no longer optimal for lynx. Park files contain only one record of lynx tracks in the Akokala drainage, observed at the junction between the Akokala Creek Trail and the Akokala Lake Trail. If lynx are present, the proposed action would not measurably affect them, given the anticipated short duration of work (four to five weeks anticipated during late summer/fall of the first year, with a possible one to two week work period the following year), and because the activity would primarily be localized to the fish barrier site. Any work occurring the following year would likely be at a similar level of activity and intensity as ongoing park-wide trail maintenance. Impacts to lynx would be negligible or less; under Section 7, the project would have "no effect" to lynx, and impacts to the species are not further analyzed.

Wolverine (*Gulo Gulo*). Proposed for Listing. On February 4, 2013, the USFWS published a proposal in the Federal Register to list the wolverine as a threatened species (Federal Register, 2013). The USFWS has determined that habitat loss from decreased snow pack in the late spring as a result of higher temperatures and climate change is likely to significantly, adversely affect wolverine populations within the contiguous United States. Continued habitat loss could

threaten wolverines in the contiguous United States with extinction (Federal Register, 2013).

Park files contain one record of a wolverine sighting in the Akokala drainage from 1989 (GNP files). Wolverines likely only use the area sporadically. Because wolverines are highly mobile, wide ranging carnivores, and since the project site is in an area that would not normally be considered wolverine habitat, the species would not be measurably affected, and the park's wolverine population would not likely be jeopardized by the project. Human activity associated with the project would also be short-term (anticipated for four to five weeks during late summer/fall of the first year, with a possible one to two week work period the following year) and localized to the barrier site. Wolverines are therefore dismissed from further analysis.

Water Howellia and Spalding's Catchfly. Federally listed as Threatened. While present in Flathead County, there are no known locations of the threatened Spalding's catchfly (*Silene spaldingii*) or the threatened water howellia (*Howellia aquatilis*) within Glacier National Park. There are no recorded observations of the species in the vicinity of either of the possible barrier locations, nor is suitable habitat that could potentially support the species known to be present. Consequently, there would be no effect to Spalding's catchfly or water howellia from the proposed project, and the species are dismissed from further analysis. However, if locations of listed plant species become known within the vicinity of the project area, the plants would be avoided.

Meltwater Stonefly *(Lednia tumana)*. Candidate Species. Due to its low elevation and warm water temperatures, Akokala Creek is not typical habitat for the meltwater stonefly. It is therefore extremely unlikely that the species would be present (J. Giersch, personal communication). The meltwater stonefly would not be impacted by the project, and is therefore dismissed from further analysis.

Whitebark Pine (*Pinus albicaulis*). Candidate Species. Whitebark pine generally occurs near treeline in subalpine zones between 5000 and 7000 feet in elevation. At 4735 feet, the elevation below Akokala Lake is too low for whitebark pine, and the species does not occur at either of the possible barrier sites. There would be no impacts to whitebark pine, and the species is not analyzed further.

State Listed Species of Concern that have been dismissed from further analysis: A number of state-listed bird species of concern and potential species of concern have been documented within approximately 1600 meters (1 mile) of Akokala Lake, including the great blue heron, northern goshawk, black-backed woodpecker, pileated woodpecker, common loon, golden eagle, and bald eagle (GNP files and MNHP 2013). The burned forest habitat in the vicinity of the lake could also be used by the Lewis's woodpecker, and a northern hawk owl was observed in the area (GNP files). While there are no known records of common loons nesting at Akokala Lake, the lake is typically occupied by at least one loon and sometimes by a pair. Akokala Lake is therefore considered a territorial lake with prime foraging habitat where nesting could occur in the future. Loons nesting on Bowman Lake (approximately 2.5 kilometers, or 1.5 miles, away) and possibly on other North Fork lakes likely forage on Akokala

Lake. Loons are not known to use Akokala Lake for staging or as a stop-over during migration. If loons have nested on Akokala Lake the same year barrier construction is underway, they would likely be preparing to migrate by late August when the project is anticipated to begin and would most likely not be on the lake during the majority of the work period. If work is necessary the following year, it too would not begin until late summer. Second year work would likely be at a similar level of activity and intensity as ongoing park-wide trail maintenance. Loons that may still be on the lake during the work period(s) would be old enough to move away from disturbances, including those generated by helicopter flights. The helicopter would also avoid flying directly over Akokala Lake. Effects to loons would therefore be negligible or less. Bald eagles are not known to nest at Akokala Lake. Bald eagles do nest at Bowman Lake, and could forage at Akokala Lake during the nesting and chick rearing period. Human activity during construction of the barrier (including any possible second year work) is not likely to disturb eagles nesting at Bowman Lake, which is on the other side of Numa Ridge and out of sight from the project area. Helicopter flights would have the greatest potential to disturb bald eagles, but the helicopter would not be permitted to fly directly over Bowman or Akokala Lake. Any disturbances to foraging eagles would be sporadic, temporary, and localized, and adverse impacts would be negligible or less. Helicopter flights would not be expected during second year work; if helicopter support is required during the second year, the same mitigations would apply (no flights over Bowman or Akokala Lakes) and impacts to loons and bald eagles would be at a similar level as the previous year. Future maintenance of the barrier would be infrequent, should not require helicopter support, and would have impacts on loons and/or bald eagles that are negligible or less. Over the long term, the fish barrier would benefit both common loons and bald eagles by better protecting the native fish assemblage in the upper Akokala drainage. Native fish tend to forage nearer the surface than do lake trout, making them more accessible to loons and bald eagles. Lake trout, by contrast, generally forage at greater depths and are less accessible. The beneficial impacts to loons and bald eagles would be negligible to minor, as they would likely extend only to individual birds using Akokala Lake, and would not measurably affect either species at the population level. Golden eagles have been observed in the upper Akokala drainage and on Numa Ridge, but there are no known golden eagle nests in the vicinity of the project area (GNP files). Other state listed bird species of concern could occur within the project area, but none would be measurably impacted by the proposed project. The work would occur in the late summer/fall (August-October), after the nesting period and after most birds have migrated from the area. Only one small, localized geographic area would be affected. Species inhabiting the forested and riparian area near the fish barrier site could be disturbed; disturbances would be short-term, occurring during one four to five week work period the first year and possibly for another one or two weeks the following year, with impacts that are minor or less. Impacts to common loons, bald eagles, and other bird species of concern are therefore dismissed from further analysis.

State listed mammalian species of concern that have been reported in the vicinity of upper Akokala Creek include grizzly bears, fisher, wolverine, lynx, and the

northern bog lemming (MNHP 2013); please see the above discussions on grizzly bears, lynx, and wolverine. Fishers have not been recently detected in Glacier National Park, previous reports are difficult to confirm, and the species may not be present. If fishers do use the project area, they are not likely to be measurably affected by the project, which would occur outside the denning period and would be of low intensity with one and possibly two work periods of short duration. Park records contain one verified record of a northern bog lemming collected in the Camas drainage in 1949 (Wright 1950), and two unverified, more recent reports from east of the Continental Divide. A species of concern data report from the Montana Natural Heritage Program (MNHP 2013) contained another reliable record of a northern bog lemming trapped in 1990 at a small, un-named lake between Akokala Lake and Bowman Lake. The fish barrier would not be constructed in a boggy area that could be occupied by northern bog lemmings, nor would it change the course of the stream and alter bog lemming habitat nearby; bog lemmings would therefore not be affected by the project. Other mammalian species of concern that occur or may occur in the park and possibly the project area include the Townsend's big-eared bat and hoary bat (MNHP 2011a). Townsend's big-eared bats have not been detected in the park; if they are present, they would be moving into subterranean hibernacula by the time the project is underway (during both the construction period in the late summer/fall and any work that may be required the following late summer/fall) and would not likely be using habitat in the vicinity of the project area. The hoary bat is a migratory bat and could be found in the habitat type characterizing the project area (MNHP 2011b). Except when roosting, bats are highly mobile and would not likely be much affected if temporarily displaced, especially since the majority of the work would be localized to a very small area. While efforts would be made to avoid cutting standing dead or live trees that could be used by bats for roosting, the project could result in the removal of some trees that provide bat roosting sites. Approximately 30 trees in total are expected to supply the necessary logs for the project, and downed timber would be used when possible; the probability that bat roosting habitat would be measurably affected is low. Adverse impacts to bats would therefore be negligible to minor. Mammalian species of concern are therefore dismissed from further analysis.

There are no known records of the northern leopard frog in the park, and no records of the western toad in the upper Akokala drainage, probably due to under-reporting. Western toads are almost certainly in the area, and amphibian use is likely. Given the localized nature of the project, the proposed action would not measurably impact any known local amphibian populations or their habitat, however. Any amphibians encountered would be moved out of the immediate work area to mitigate any potential impacts. Amphibian species of concern would not be impacted and are therefore dismissed from further analysis.

While distribution and abundance of invertebrate species of concern within the park are not well known, impacts are expected to be non-existent to negligible. Invertebrate species of concern are therefore dismissed from further analysis.

Vascular Plants. No rare plants or rare plant habitats are known to be located along Akokala Creek or within either of the possible barrier sites. This topic is

therefore dismissed from further analysis.

Water Resources

NPS policies require protection of water quality in accordance with the Clean Water Act. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The US Army Corps of Engineers (COE) has been charged with evaluating federal actions that result in potential degradation of waters of the United States and issuing permits for actions in accordance with section 404 of the Clean Water Act. The US Environmental Protection Agency (EPA) also has responsibility for oversight and review of State programs and permits which affect waters of the United States. If the preferred alternative is implemented, all necessary federal, state and local permits would be obtained to ensure compliance with the Clean Water Act.

There would be no long-term impacts to water resources/water quality in Akokala Creek as a result of the fish barrier project. Stream flow would remain similar to existing conditions and would not be altered enough to adversely affect the stream channel. There may be short-term pulses of sedimentation from in-stream disturbances during the work period, but no long-term effects. These small sediment releases would be minimal since construction would occur during the low water period in late summer and fall. Turbidity and water temperature would not be impacted over the long term. In addition, most of the stream bottom in the project area consists of very large cobble and boulders. A temporary diversion dam may be used to temporarily dewater the work area during construction and minimize work in flowing, deeper water. If used, the temporary diversion dam would largely be placed on top of the streambed, and there would be little sediment generated by its installation. Heavy plastic would line the short diversion as necessary and little sediment is anticipated to be generated by the diversion itself. However, during construction, a park employee would be at the construction site to monitor sediment releases. If these releases are deemed excessive (highly unlikely given the large substrate material), the activity would be halted until the stream clears. At that time work activities would proceed. The proposed project would also not change water temperatures. Any adverse impacts to water resources would be localized, negligible, and short-term; water resources are therefore dismissed from further analysis.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate the discharge of dredged, material, fill material, or excavation within U.S. waters. NPS policies for wetlands as stated in 2006 *Management Policies* and Director's Orders 77-1 *Wetland Protection* strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1 *Wetlands*

Protection, the potential adverse impacts of proposed actions must be addressed in a separate statement of findings (SOF).

Glacier National Park vegetation resource staff surveyed both possible barrier sites for wetland vegetation. No wetland plant species were detected at either site. Wetland species were documented on the east shore of the lake more than 100 yards upstream of the uppermost site, which is the most likely location for the barrier; these wetland species would not be impacted. Because there are no wetlands in the Akokala Creek project area and there would be no impacts to upstream wetlands, a statement of findings has not been prepared. Wetlands are therefore dismissed from further analysis.

Soils and Vegetation

The NPS strives to maintain all components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of plants (NPS 2006). The NPS also preserves the soil resources of parks and protects soils by preventing unnatural erosion, physical removal, or contamination (NPS 2006). The proposed fish barrier would cause negligible to minor impacts to soils and vegetation at either site under consideration. Impacts to vegetation would be lowest at the downstream site due to the absence of riparian vegetation and because there are plenty of trees to provide construction material for the barrier. Work crews travelling in and out of the project area would have slight adverse impacts to soils and vegetation between the Akokala Lake Trail and the work site, and construction activity for at least one and possibly two work periods may result in very minor impacts to soil adjacent to the creek bank; these impacts would recover in a short period of time. Trampling and moving logs into place could temporarily affect ground cover and shrubby vegetation. But by the time the project begins in late summer, several plant species would be nearing their dormancy stage and would be less vulnerable than in the spring. Affected vegetation would likely recover completely without intervention from park staff. The uppermost of the two barrier sites being considered is located in unburned forest, and the downstream site is in within a burned area. There are abundant trees in the vicinity of either site that would be suitable to use for the barrier's construction. There is also a ready supply of standing dead timber in nearby burned areas. Downed trees would be used when possible, provided they are sound enough for the barrier to remain structurally durable over the long term. Live trees and some standing dead timber would be used; approximately 30 trees would likely be needed for the project. Trees between approximately 12 and 20 inches in diameter would be selected. The removal of this material would result in a very minor impact to vegetation as there are abundant seedlings/saplings and mature trees in the adjacent forests and the removal of the necessary trees would not affect the integrity of the stand as a whole. Regeneration of young trees is a rapid process in the moist climate of the North Fork Flathead River drainage and any trees removed for the project would eventually be naturally replaced. Because impacts would be minor or less, soils and vegetation have been dismissed from further analysis.

Wild and Scenic Rivers

The project would occur on Akokala Creek, a tributary of the North Fork of the Flathead River, which is designated as a Wild and Scenic River. The barrier site

would be over eight stream miles from the river and is outside the Wild and Scenic River Corridor; the corridor would therefore not be affected by any activities or sediment releases at the project site. There would be no short or long-term effects to the North Fork of the Flathead River and no change in water quality, riparian areas, floodplain conditions, or any of the outstanding, remarkable, values which led to its designation as a Wild and Scenic River. Therefore, Wild and Scenic Rivers are dismissed from further analysis.

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq*.) was established to promote the public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associate with NPS units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Glacier National Park is classified as a mandatory Class I area under the Clean Air Act, where emissions of particulate matter and sulfur dioxide are to be restricted. Air quality is considered good in Glacier National Park. There are no metropolitan areas within 125 miles of the park, and no regional smog typical of highly populated areas with a high amount of vehicle traffic. Air quality would not be measurably affected by the barrier, including low-level emissions from motorized equipment during its construction. Impacts to air quality are therefore dismissed from further analysis.

Night Skies

In accordance with 2006 *Management Policies*, the NPS strives to preserve natural night skies and will "minimize light that emanates from park facilities, and also seek the cooperation of park visitors, neighbors, and local government agencies to prevent or minimize the intrusion of artificial light into the night scene of the ecosystems of parks". Glacier National Park considers the impacts to night skies in all projects. Night work is not anticipated during construction of the fish barrier, and the completed structure would not involve lighting of any kind. Night skies would not be impacted by the project, and the topic is dismissed from further analysis.

Climate and Sustainability

The Intergovernmental Panel on Climate Change (IPCC) predicts "impacts of climate change will vary regionally but, aggregated and discounted to the present, they are very likely to impose net annual costs which will increase over time as global temperatures increase" (IPCC 2007). Although climatologists are unsure about the long-term results of global climate change, it is clear that the planet is experiencing a warming trend that affects global weather patterns. While these changes will likely affect precipitation patterns and other weather related processes in the parks, there are many variables that are not fully understood and there may be variables not currently defined which could influence localized weather and climate changes. A climate change scenario framework developed for the Crown of the Continent Ecosystem (of which Glacier National Park is at the center) identified four possible climate response scenarios ranging from gradual to abrupt temperature increases combined with decreasing or increasing precipitation (Hartman 2012). The framework further identified a number of ecological changes within each of the four scenarios, such

as the frequency and intensity drought, flooding, storms, and wildfire, for example, which vary according to the degree of temperature change and precipitation increase and decrease. Each scenario suggests ecological changes that would likely affect aquatic habitat and stress native fish species in the park, underscoring the importance of providing habitat refugia that is free of the additional stressors presented by non-native invasive species. The park's proposal to construct a fish barrier to protect native fish and provide such a refugium would therefore be an appropriate safeguard under any of the four identified scenarios. The proposed project would not be expected to measurably impact the global climate due to its small scale and because it would not result in measureable increases or reductions in greenhouse gas emissions. But the barrier would likely benefit native fish in the face of climate change, regardless of the overall long-term results of climate change in the park. Therefore, climate change as a stand-alone topic has been dismissed from further analysis.

Cultural Resources

For Section 106 purposes and unless additional information is raised during review of this EA, the park will document a "no historic properties affected" finding when this EA is transmitted to the Montana State Historic Preservation Office (SHPO).

Historic Structures and Cultural Landscapes. The project is located in an undeveloped area of the park. No historic buildings and structures or cultural landscapes are in the project area. The area of potential effect has been surveyed; no identified and/or unevaluated historic properties exist, and the probability of discovering historic properties within the area of potential effect is highly unlikely. Historic structures and cultural landscapes are therefore dismissed from further analysis.

Archeological Resources. The park's archeologist surveyed the Areas of Potential Effect for the proposed project on October 30, 2013, and no archeological resources were identified (Rowley 2013). Both of the proposed barrier locations are in the creek bottom where there is no soil. There is no possibility of a trail or travel route along the creek at these locations, and no archeological resources were identified in areas adjacent to the potential barrier sites. If archeological resources are identified during the project, consultation with the SHPO and Tribal Historic Preservation Offices would occur in accordance with federal legislation and regulations and NPS policy. Archeological resources are therefore dismissed from further analysis.

Ethnographic Resources. Ethnographic resources are defined by the NPS as "the cultural and natural features of a park that are of traditional significance to traditionally associated peoples" (NPS 2006). Neither the Blackfeet Tribe nor the Confederated Salish and Kootenai Tribes (CSKT) raised concerns about the proposed action during scoping for this project. In March of 2013, the park discussed the change in location for the proposed barrier with the CSKT (the location was changed from the bridge on the Inside North Fork Road to a site downstream of Akokala Lake). The tribe did not raise any concerns about the new location. Therefore, the proposed action is not expected to impact ethnographic resources and ethnographic resources have been dismissed from further analysis. However, Glacier National Park recognizes that the tribes hold a

body of knowledge that may result in the identification of ethnographic resources in the area in the future. If ethnographic resources are identified later, consultation would occur in accordance with federal legislation and regulations and NPS policy.

Museum Collections

According to the NPS *Management Policies* (2006) Director's Order 24 *Museum Collections*, the NPS requires consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript materials). NPS policy defines museum collections management including policy, guidance, standards, and requirements for preservation, protection, documentation, access, and use. Museum collections would not be affected by this project and are dismissed from further analysis.

Visual Resources

Visual resources near Akokala Lake are characterized by a pristine alpine lake, scenic vistas of rugged mountain peaks, and a once forested landscape regenerating from fire. The completed barrier would impact the appearance of these visual resources only in the immediate vicinity of the structure. The barrier would not be visible from the Akokala Lake Trail, and would affect the viewshed only for those who venture off trail and bushwhack to the creek. Helicopter flights associated with the project could temporarily disrupt scenic values within the Akokala drainage, but such disruptions would be few and very short-term, and would not result in any lasting effects to the viewshed. If a second year work session is required to complete the barrier, helicopter use would not be anticipated; if helicopter support is required, impacts to the viewshed would occur to a similar degree as the previous year. Impacts to visual resources would be negligible to minor, and the topic is dismissed from further analysis.

Visitor Use and Experience

The Akokala drainage is used by both day hikers and overnight backcountry visitors. Visitors access the area via the Akokala Creek Trail, the Akokala Lake Trail, and the Bowman Lake Trail over Numa Ridge. The fish barrier would be constructed in late August/October after the peak visitor use period and would not permanently alter the way visitors use the area. Work that may be required the following year would also occur in late summer/fall and would likely be at a similar level of activity and intensity as ongoing park-wide trail maintenance. Helicopter flights could disturb visitors along the flight path during both the first and second year of work, although helicopter use would not be anticipated during second season work. Visitor use and experience would be temporarily adversely affected if some visitors choose to avoid the area while work is underway, and because noise from helicopter flights and some motorized tools and equipment would be audible during the project. Because project related noise would be temporary, intermittent, and largely localized to the immediate barrier site, and since the completed barrier would not be visible from the trail and would go unnoticed by most visitors, adverse impacts to visitor use and experience would be minor and short-term.

The project would benefit recreational anglers by better protecting the species composition of available fish. Conversely, taking no action to construct the fish barrier could cause a reduced abundance of westslope cutthroat trout, the

primary species caught by anglers in Akokala Lake. These impacts would be minor, since they would directly apply to only a single segment of the visiting public. Visitor use and experience is therefore dismissed from further analysis.

Socioeconomics

There would be no change to socioeconomic resources under either alternative. Visitor numbers would not change, and park concession operations and local businesses would not be impacted. The topic is therefore dismissed from further analysis.

Environmental Justice

Executive Order 12898 – General Actions to Address Environmental Justice in Minority Populations and Low-income Populations requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the *Environmental Protection Agency's Environmental Justice Guidance* (1998) would not occur from the action proposed in the preferred alternative. Therefore, environmental justice was dismissed from further analysis.

Prime and Unique Farmlands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agriculture uses. There are no prime and unique farmlands located within Glacier National Park (NPS 1999).

Human Health and Safety

NPS *Management Policies* (2006) states the safety and health of all people are core Service values. Public health is addressed in Director's Order 83 *Public Health and Vector-borne and Zoonotic Disease* and employee health is addressed in Director's Order 50 B *Occupational Health and Safety Program*. These policies call for risk recognition and early prevention for a safe work and recreational environment, and the NPS is committed to eliminating and reducing health and safety risks when they are identified. Therefore, there would be no impacts to human health and safety from the project and the topic is dismissed from further analysis.

Park Operations

There are no developed areas in the vicinity of Akokala Lake. Park operations are therefore minimal, limited primarily to trail maintenance. The fish passage barrier would be constructed by approximately six members of the park's trail crew. Construction of the barrier would take approximately four to five weeks during the first year and possibly one to two weeks the following year. The project would be within the normal scope of trail work in the park and would be scheduled well ahead of time, and it would not disrupt other trails projects. There would therefore be no additional effects to park operations under the preferred alternative, and this topic is dismissed from further analysis.

Alternatives

An interdisciplinary team of Glacier National Park staff has identified two alternatives, action and no action, which have been carried forward for further evaluation. Two alternate barrier designs, three alternate locations, and two alternative methods of implementing the project were considered but dismissed and are described under *Alternatives Considered but Eliminated from Detailed Study*.

Alternatives Carried Forward

Alternative A: No Action

The no action alternative describes the conditions that would continue to exist in the upper Akokala drainage if a fish barrier was not constructed. The no action alternative provides a baseline for evaluating the changes and related environmental impacts that would occur under the action alternative.

Under the no action alternative, the NPS would not construct a fish passage barrier downstream of Akokala Lake. Non-native lake trout would be able to move freely into the upper Akokala system, including Akokala Lake. Rainbow and brook trout also present a threat to the upper Akokala system; rainbow trout would likely continue to enter the drainage as they expand within the North Fork Flathead River drainage and would eventually threaten the remaining genetically pure populations of westslope cutthroat trout that exist in Akokala Lake.

Alternative B: Construct a Fish Passage Barrier on Akokala Creek (Preferred)

Under this alternative, the NPS would construct a fish passage barrier in Akokala Creek at one of two possible locations downstream of Akokala Lake (Figure 1). Due to channel gradient and valley confinement, the most suitable sites are located in the upper portion of the watershed. The site nearest the outlet of Akokala Lake would most likely be selected, based largely on constructability of an effective barrier, hydraulic modeling, and other analyses. The design of the Akokala Creek barrier would be based on similar structures constructed elsewhere in the region. See Figures 2-4 for photographs of barriers on Specimen Creek and Grayling Creek in Yellowstone National Park and Quartz Creek in Glacier National Park; the proposed barrier on Akokala Creek would be similar to these barriers in scale and general appearance. The barrier would force much of the flow into the middle of the channel and over the center of the structure, thereby serving as a velocity and height barrier for fish attempting to migrate upstream. The barrier would not impede downstream movements of native fish.

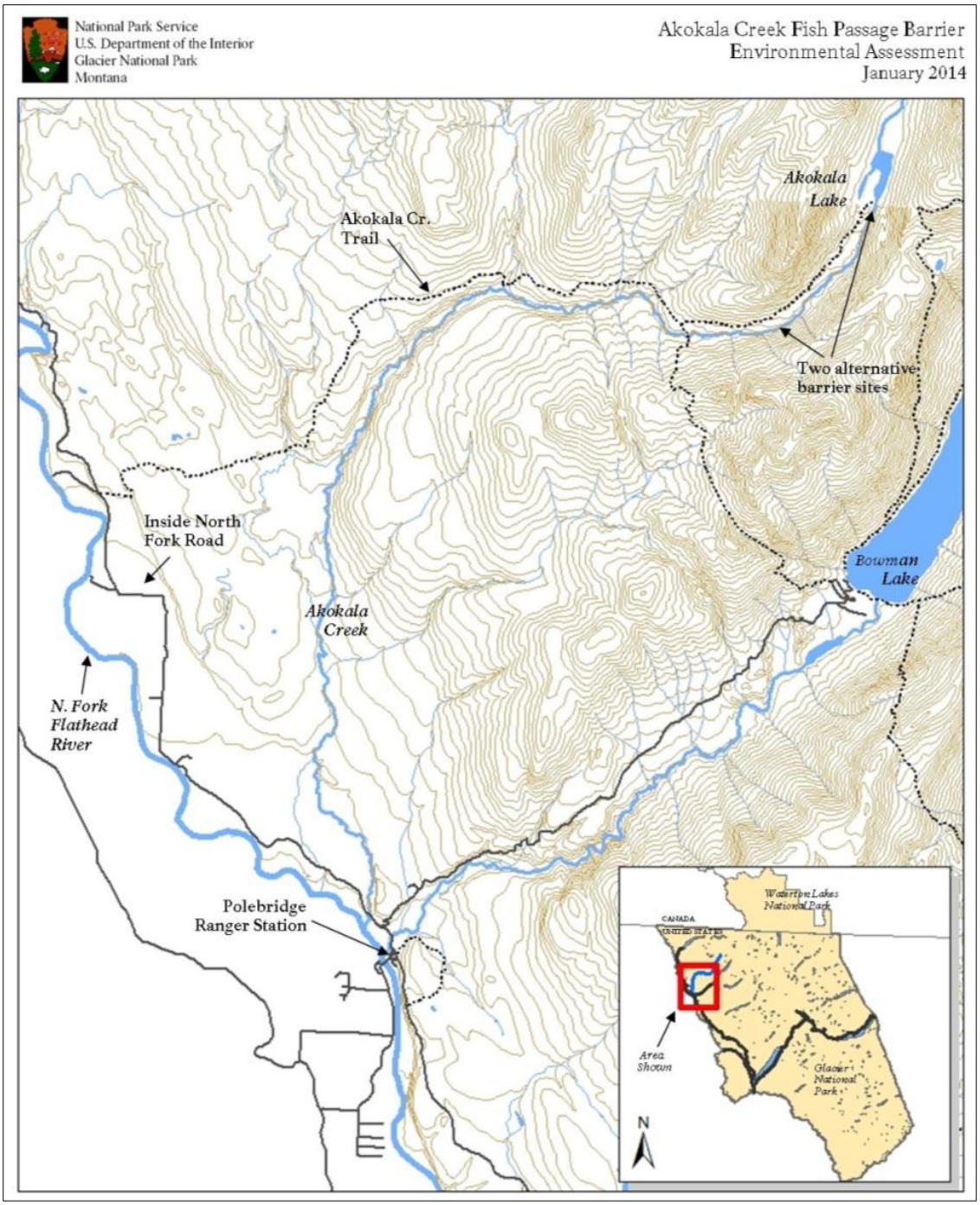

Figure 1: Akokala drainage with two possible barrier sites.

Figure 2: Specimen Creek fish passage barrier, Yellowstone National Park (NPS photo).

Figure 3: Fish passage barrier on Grayling Creek in Yellowstone National Park (NPS photo).

Figure 4: Quartz Creek fish passage barrier in Glacier National Park (NPS photo).

The height of the Akokala Creek barrier would vary across its length, ranging from approximately five feet tall in the center to approximately ten feet tall at the banks. The structure would be taller near the banks to keep water from spilling over in these areas and undermining the barrier during extreme peak-flow events. These heights also serve to concentrate stream flow into the center of the channel and increase water velocity over the barrier. The structure would span the width of the stream channel, extending onto either bank where the ends would be anchored (Figures 5 and 6). The barrier would consist of logs, rock-filled log cribs and rock-filled gabions (metal cages) or other similar functioning structures. It would also include a sloped, hardened splash pad, or apron, on the downstream side of the structure constructed of gabions and rock. Concrete may be used to reinforce the structure and/or apron as needed. Water would flow over the crest of the barrier onto the splash pad/apron, which would create an area of shallow flow downstream and prevent the formation of a "jump pool". The splash pad/apron would be very difficult for upstream migrating fish to negotiate, and would be constructed at an elevation such that the barrier would remain effective up to a 25-year flow event (Figures 7-8). If necessary, a screen may be installed on top of the center of the barrier to further block fish from jumping or swimming upstream at low flows. At higher peak flow recurrence intervals, there may be some opportunity for fish to move upstream and over the structure, but the 25-year flow design represents a compromise between effectiveness and constructability in a backcountry location.

The barrier would be constructed by hand, using as much native material as possible. Rocks used to fill the gabions would be found onsite, and the logs would be obtained from standing dead timber as well as live trees. An estimated 30 trees, approximately, should supply the necessary logs; downed timber would be used when possible, provided it is sound enough to provide structural durability over the long term. The logs would be collected and/or cut onsite with chainsaws and dragged to the work area using hand tools. To minimize ground disturbance, smaller diameter "roller logs" would be placed across the path of the log that is being hauled, and the logs would be rolled over the ground. Trees would be selected for removal from areas that are not readily visible from the Akokala Lake Trail. Some downed logs or brush may be cut or moved to facilitate off-trail access from the Akokala Lake Trail to the worksite.

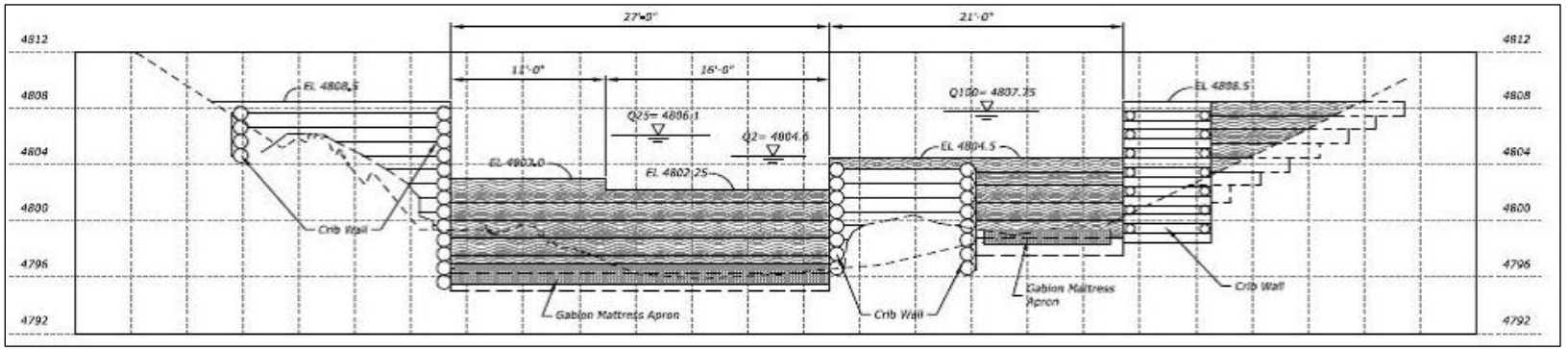

Figure 5: Proposed barrier schematic (cross section).

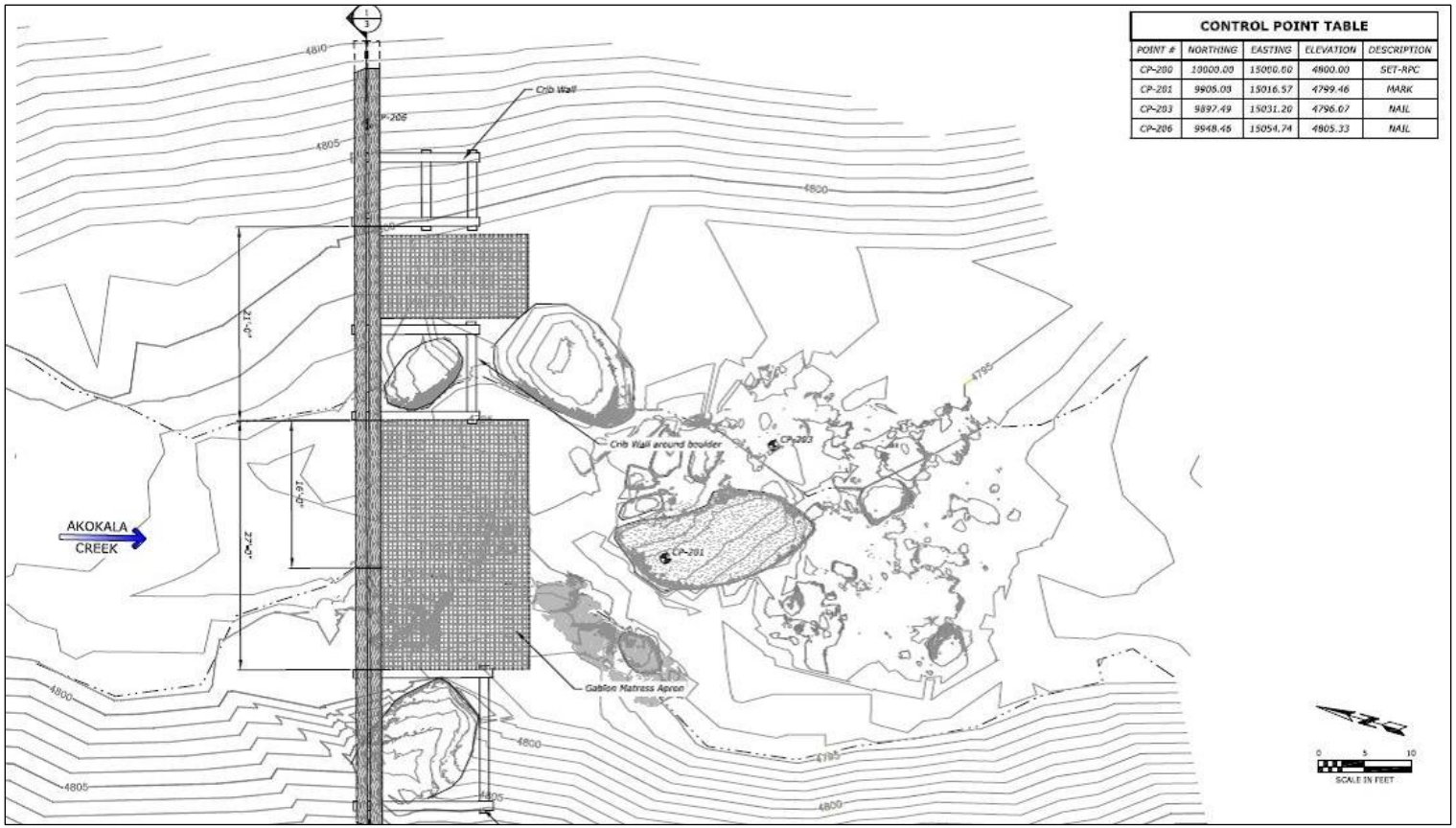

Figure 6: Proposed barrier schematic (site plan).

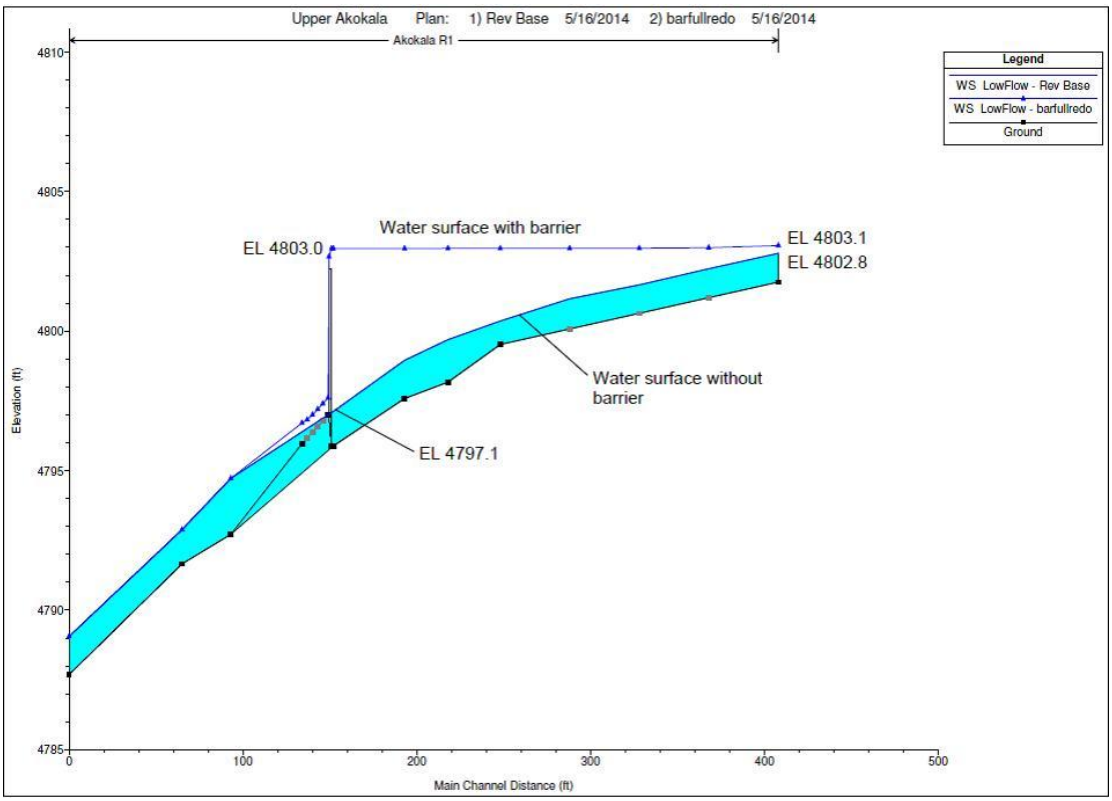

Figure 7: Modeled water surface elevations at low-flow (25 cubic feet per second) with the proposed barrier.

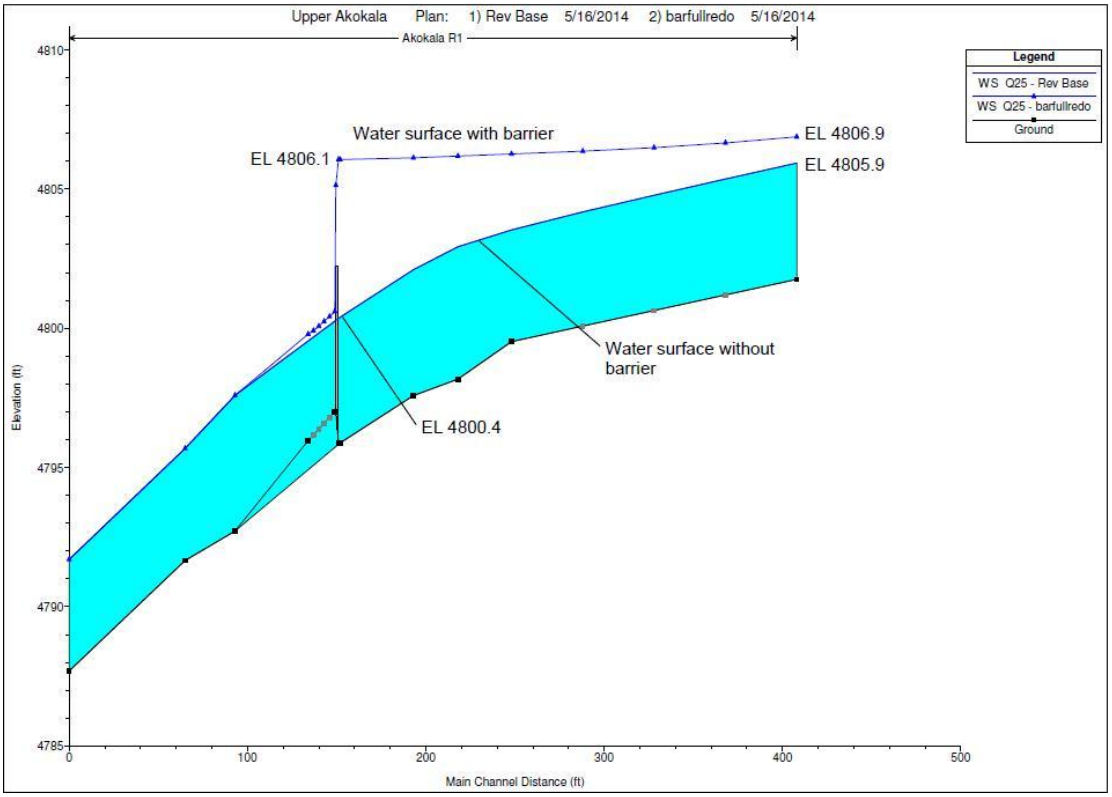

Figure 8: Modeled water surface elevations during a 25-year flow event over proposed barrier.

A temporary diversion dam may be used to temporarily dewater the work area during construction. This non-inflatable, horse-packable diversion structure worked extremely well during construction of the Quartz Creek barrier. Temporarily diverting water from the work site would reduce downstream turbidity and erosion during construction. It would also provide the driest possible working conditions, enabling workers to spend less time with their hands in very cold water and thus allowing them to do a better job building a structurally sound foundation. A small bypass channel may be constructed around the work site and lined with plastic as necessary. The diversion would be removed after the work is completed. Backpack electrofishing would be used as necessary to remove any fish from any sections of dewatered stream during the project. Some hand excavation along the creek banks may be necessary to anchor the barrier into the banks and ensure no openings are left that fish could fit through. Any disturbance to physical stream habitat would be repaired upon completion of the project.

In addition to chainsaws, other motorized equipment that may be used onsite during the project include one or two water pumps, a rock drill, a small gas-powered portable generator, and other mechanized hand tools as necessary. If concrete is used, it would be mixed onsite, by hand, if possible; a small, portable, electric concrete mixer may be used depending on the necessary volume/quantity of concrete. The water pumps would be used to help divert water if necessary, the rock drill would be required to anchor the structure to boulders or logs, and the generator would be needed to charge equipment and/or batteries and run the electric concrete mixer if necessary. Traditional hand tools would be used whenever possible.

Pack stock would be the primary method for bringing equipment and supplies to the work site. Three round-trip helicopter flights (approximately, with one or two flights expected on one or two days, likely followed by a final flight on a subsequent day) would be required to haul equipment and materials that cannot be packed on stock and to remove equipment that cannot be packed out after the project is complete. Equipment and materials brought in by helicopter would be transported and delivered to the work site as long-line sling loads. Standard park-specific NPS administrative helicopter flight policies and procedures would be followed for all flights. Flight times are not anticipated to exceed 45 minutes one way between West Glacier and the staging area (likely in the Polebridge vicinity), and 45 minutes round trip between the staging area and the work site. (The use of helicopters and other motorized equipment is evaluated in this EA and the Minimum Requirements Decision Guide [MRDG], Appendix A.)

The barrier would be constructed by NPS trails crew with oversight and support from the park's fisheries biologist and the engineering firm that developed the design. The work crew (estimated at six) would camp at the Akokala Lake campground during the work period. Work would occur in the late summer and fall (late August-October), during low water flow periods. The project is anticipated to require an estimated four to five weeks during the first season (anticipated for 2014) and possibly another one to two weeks the following year. If second year work is necessary, we do not anticipate the need for helicopters or tools other than those typically used by NPS trail crews during the summer trail maintenance season. Work would begin each day no earlier than one hour after sunrise and would stop no later than one hour before sunset.

The completed Akokala Creek fish barrier may require maintenance following the first spring runoff after completion. Future maintenance of the barrier would then be expected infrequently (approximately every seven to ten years) and should not require helicopter use.

Mitigation Measures

The following mitigation measures would minimize the degree and/or severity of adverse effects and would be implemented during the project:

Fisheries

- Electrofishing would be conducted to remove fish in the project vicinity immediately prior to commencement of work.
- Work would occur during low water periods to minimize sediment generation and physical habitat disturbance.
- Protocols to prevent Aquatic Invasive Species from entering the waterway would be followed.

Wildlife and Threatened and Endangered Species and Species of Concern

- Helicopters would avoid flying directly over Bowman or Akokala Lake, and would avoid other sensitive locations. Flight paths would be designated so as to avoid open alpine meadows where grizzly bears that are present would not have access to cover.
- The helicopter would fly at a minimum of 2000 feet AGL over the park whenever possible, depending on mountainous topography, and except when it is landing or taking off or when it is delivering supplies via long line.
- Work would begin and helicopter flights would occur no earlier than one hour after sunrise and would stop no later than one hour before sunset to minimize disturbances to foraging or migrating bald eagles, common loons, grizzly bears, and other wildlife.
- Work crews would be trained on appropriate behavior in the presence of wildlife and on proper storage of food, garbage, and other attractants.
- The work would not occur until late summer, when critical nesting, denning, and brood rearing periods are over.
- If standing dead and live trees are required for the project, they would first be assessed by NPS staff for wildlife use. Trees showing signs of foraging or that have cavities, sloughing bark, or broken tops would be avoided if possible.
- Any amphibians encountered would be moved out of the immediate work area.

Vegetation

- All equipment and materials used at the site would be cleaned and inspected prior to transport to prevent the spread of non-native invasive plants and aquatic invasive species.
- Glacier National Park's Best Management Practices would be implemented to minimize the extent of impacts.
    - Disturbance to vegetation would be avoided as much as possible and contained to as small a footprint as possible while meeting project objectives.

Soils

- Glacier National Park's Best Management Practices would be implemented to minimize the extent of impacts.
    - Disturbance to the ground would be avoided as much as possible and contained to as small a footprint as possible while meeting project objectives.
- Erosion control measures that provide for soil stability and prevent movement of soils into waterways would be implemented as needed.

Recommended Wilderness

- Non-electric tools would be used as much as possible to reduce artificial noise.
- Workers would camp at the Akokala Lake campground.
- Administrative helicopter flights would be coordinated with other projects in the area and hauling needs would be combined as possible to minimize administrative flights over recommended wilderness. Construction debris, equipment, and garbage that could not be packed out would be flown out on back-hauls of incoming flights.
- The staging area for helicopter flights would be located outside the North Fork's Wild and Scenic River Corridor.
- Work would be conducted during the late summer/fall (late August-October), after the peak visitation period, to minimize the number of visitors impacted by project activities.
- Logs would be collected well away from the trail, where evidence of their removal is not visible to hikers.
- Once the project is completed, brush, logs, and forest debris would be used to naturalize the immediate work site and the trail to the work site.

Natural Soundscapes

- Non-electric tools would be used as much as possible to reduce artificial noise.

Visitor Use and Experience

- Notifications of the proposed project would be posted at Akokala drainage trailheads on the Inside North Fork Road and at Bowman Lake for the duration of the project.
- All overnight visitors would be advised in advance about potential noise and activity in the area.

Alternatives Considered but Eliminated from Detailed Study

Alternate locations and designs for the fish passage barrier and two alternative methods of implementing the project have been dismissed and are addressed below.

Construct the barrier at or immediately upstream or downstream of the Akokala Creek Bridge along the Inside North Fork Road. The Akokala Creek fish passage barrier was originally conceived as a structure that could be installed at or near the Akokala Creek Bridge, where it would be outside of recommended wilderness and where it would protect the greatest amount of habitat (Muhlfeld et al. 2012). This alternative was proposed in the public scoping brochure for the project. Under this original proposal, the park considered either one or more concrete box culverts at the bridge, or a two-step low water crossing just downstream of the bridge. During the design phase, however, topographic surveys and hydraulic modeling data indicated that the effectiveness of a barrier at the bridge would be severely hindered by the topography of the area, the broad floodplain in the vicinity of the bridge, and the low gradient of the stream. Construction would also require major channel modification downstream of the bridge site, which would encroach on the Wild and Scenic River Corridor. Also, with preliminary estimates at between $500,000-$700,000 (S. Leon, Western Federal Lands Highway Division, personal communication), the cost of constructing the barrier at the bridge would be prohibitive, especially if the finished product would only be partially effective at best.

In addition, migratory cutthroat trout from Flathead Lake use lower Akokala Creek for spawning (Muhlfeld et al. 2009) and placing the barrier at the bridge would substantially reduce the amount of habitat available for their use. Hybridization between westslope cutthroat trout and rainbow trout has also been documented upstream of the bridge (R. Leary, MFWP,

personal communication), further compromising the effectiveness of a barrier at this location. A migratory westslope-rainbow trout hybrid was previously documented entering Akokala Creek and likely spawned in lower Akokala Creek (Muhlfeld et al. 2009). Hybridization is likely a recent development and the upper portions of the drainage do not appear to be impacted. A genetic survey in Akokala Creek conducted in 2008 (R. Leary, MFWP, personal communication) did not indicate any evidence of hybridization near the Bowman Lake Trail crossing, which is located approximately two miles downstream of the general location for the barrier under the current proposal. For these reasons, plans to construct a barrier at the bridge were dismissed. A barrier upstream or downstream of the Akokala Creek Bridge was considered but dismissed because the stream gradient and topography in the area are too low (similar to that of the bridge location).

Use only non-motorized hand tools and equipment to construct the fish barrier. With the current proposal to build the barrier below Akokala Lake and therefore within recommended wilderness, constructing the barrier with non-motorized hand tools alone was considered and evaluated in the MRDG for the project (Appendix A). Based on the MRDG evaluation, this method was dismissed because it would prolong the duration of the project to an estimated ten to twelve weeks, increasing the amount of time work crews and livestock would be in the project area and therefore the overall level of disturbance to other resources. The barrier would also not be sufficient to prevent lake trout and other non-native fish from getting past it, because using non-motorized hand tools alone would severely limit the crew's ability to construct a durable, structurally sound and effective barrier.

Transport materials to the work site without helicopter support. Using livestock to transport equipment to the worksite below the lake was considered and evaluated in the MRDG for the project (Appendix A). Based on the MRDG evaluation, this alternative was dismissed because some of the materials and gear (e.g. generator, water pump, possible concrete mixer) essential to the success of the project are too large, heavy, or awkward to pack on livestock and therefore could not be used. The success of the project and the efficacy of the barrier would be jeopardized and the risk of long-term adverse impacts to native fisheries would increase. Only using livestock would also require multiple trips into the backcountry over a prolonged period of time, including several off-trail trips between the Akokala Lake Trail and the worksite, increasing impacts to trails, soils, and vegetation. The use of livestock to transport some equipment and materials has been retained under the preferred alternative however, to reduce the number of helicopter trips.

Alternatives, Suggestions, and Concerns from Public Scoping

Eleven comment letters were received during scoping. Eight letters were supportive of the proposal to construct a fish passage barrier, and one expressed appreciation for notification of the project but declined to comment on the basis of it being outside their expertise. Two letters, one from the Army Corps of Engineers and one from the Montana Department of Environmental Quality, addressed the need for applicable state and federal water permits. Suggestions and concerns from public scoping are addressed below.

Comment: Consider diverting the stream around the work area to reduce turbidity and sediment generation in general during the construction phase of the project. **Response:** As described under *Preferred Alternative*, water would be temporarily diverted from the work site during construction.

Comment: Please consider the effect that a fish barrier may have on any migratory native species of fish that occur in the Akokala drainage. **Response**: This is addressed in *Affected*

Environment and Environmental Consequences, Fisheries, Alternative B.

Comment: We have concerns about the impacts that a fish barrier might have on water quality, especially during spring runoff or high water events, and the possible alterations to the stream channel that may have a detrimental effect on the native fish species that inhabit it. **Response**: This is addressed in *Impact Topics Dismissed from Further Analysis, Water Resources*, and *Affected Environment and Environmental Consequence, Fisheries, Alternative B.*

Comment: Please consider that almost the entirety of Akokala Creek is within recommended wilderness, and that any action taken needs to consider the effects to recommended wilderness. This includes increased disruption to wildlife due to motorized access or helicopter flights, reduction in solitude due to work crews and loss of apparent naturalness of the creek corridor. **Response**: Impacts to recommended wilderness have been addressed in this EA under *Affected Environment and Environmental Consequences, Recommended Wilderness*, and also in the MRDG (Appendix A).

Comment: The mouth of Akokala Creek and the proposed fish barrier location lie within the Wild and Scenic North Fork Flathead River corridor. It is necessary to minimize disruption within the Wild and Scenic corridor and minimize the fish barrier's impact to its character, as well as any additional loss of natural appearance due to human actions. **Response**: The revised proposed barrier site lies outside of the Wild and Scenic River corridor. Impacts to the Wild and Scenic River corridor are discussed *under Impact Topics Dismissed from Further Analysis, Wild and Scenic Rivers*; mitigation is described under *Mitigation Measures, Recommended Wilderness.*

Alternative Summaries

Table 2 summarizes the major components of Alternatives A and B and compares the ability of these alternatives to meet the project objectives (as identified in the *Purpose and Need*). As shown, Alternative B, the preferred alternative, achieves all project objectives while Alternative A, the no action alternative, achieves none.

Table 2: Summary of alternatives and how each alternative meets project objectives.

Alternative Elements	Alternative A – No Action	Alternative B – Preferred
Construction of a fish passage barrier	No fish passage barrier would be constructed.	A fish passage barrier would be constructed on Akokala Creek downstream of Akokala Lake. The barrier would consist of logs and rock-filled gabions (metal cages) or similar functioning structures, and possibly concrete. It would funnel flows through the center of the channel at increased velocities over a drop; a downstream splash pad would be constructed to prevent a jump pool from developing.
Non-native lake trout	The potential for lake trout to colonize Akokala Lake would remain.	The barrier would eliminate upstream passage of lake trout during non-flood periods (up to a 25-year flow event) and reduce the likelihood of upstream passage during higher flood flows.
Other non-native fish species	Non-native rainbow trout would likely reach Akokala Lake and the upper drainage and eventually threaten remaining genetically pure westslope	The barrier should block upstream passage of other non-native fish during non-flood periods (up to a 25-year flow event) and greatly reduce the

	cutthroat trout. Non-native brook trout would also be able to access the upper Akokala drainage.	likelihood of upstream passage during higher flood flows.
Native fish	No action would be taken to better protect native fish habitat from invasive, non-native fish. A genetically distinct population of bull trout and remaining genetically pure westslope cutthroat trout would be threatened.	Native fish would likely not be able to migrate upstream of the barrier, except possibly during extreme flood flows; downstream passage of native fish would not be impeded.
Project Objectives	**Meets Project Objectives?**	**Meets Project Objectives?**
Reduce the potential for non-native fish, including invasive lake trout and brook trout, to enter Akokala Lake and the upper Akokala drainage.	No. Akokala Lake and the upper Akokala drainage would remain accessible to non-native fish species, including lake trout and brook trout.	Yes. A fish passage barrier would greatly reduce the potential for non-native fish to enter Akokala Lake and the upper Akokala drainage.
Protect the integrity of native fish populations in the face of the potential added stressors associated with climate change.	No. Secure, ecologically intact habitat would be less available to native fish populations faced with potential stressors of climate change.	Yes. Native fish populations faced with the potential stressors of climate change would continue to have access to secure, ecologically intact habitat.
Protect a genetically distinct population of the threatened bull trout in the upper Akokala drainage, and thereby assist with bull trout conservation efforts on a regional scale.	No. Akokala Lake's genetically distinct bull trout population would be threatened by non-native invasive lake trout. The potential loss of the Akokala drainage's bull trout fishery would undermine region-wide bull trout conservation efforts.	Yes. Akokala Lake's genetically distinct population of bull trout would be protected for the long-term, thereby contributing to regional bull trout conservation efforts.
Protect the native westslope cutthroat trout population in Akokala Lake and the upper Akokala drainage from expanding hybridization with non-native rainbow trout.	No. Rainbow trout would most-likely colonize Akokala Lake and threaten remaining genetically pure westslope cutthroat trout with hybridization.	Yes. The potential for non-native rainbow trout to enter Akokala Lake would be greatly reduced by an effective fish passage barrier, reducing the potential for expanding hybridization with native westslope cutthroat trout.
Conserve and maintain the natural condition of the park's recommended wilderness by protecting native fish populations and the ecological integrity of the backcountry lakes they inhabit.	No. Threats to native fish populations in the Akokala drainage, including the potential loss of a genetically distinct bull trout population, would degrade the ecological integrity and thus the natural condition of recommended wilderness in the area for the long term.	Yes. The protection of native fish populations in the Akokala drainage would maintain the ecological integrity and natural condition of recommended wilderness in the area for the long term.

Table 3 summarizes the anticipated environmental impacts for Alternatives A and B. Only those impact topics that have been carried forward for further analysis are included. The *Affected Environment/Environmental Consequences* chapter provides a more detailed explanation of these impacts.

Table 3: Impacts on resource topics under each alternative.

Impact Topic	No Action Alternative	Preferred Alternative
Fisheries, bull trout, and westslope cutthroat trout	Moderate to major adverse, short and long-term, and local to regional effects on native fish populations in Akokala Lake and the larger Flathead Basin would occur from the loss of the adfluvial bull and genetically pure westslope cutthroat trout populations in Akokala Lake.	Moderate, long-term, site-specific to regional beneficial impacts on native fish populations in Akokala Lake and the larger Glacier National Park landscape would occur due to a greatly reduced potential for non-native fish to enter Akokala Lake and harm native fish populations. Minor, adverse, short and long-term and site-specific to local impacts to fisheries would occur from disturbances to the stream bed during project implementation and isolation of the lake. Under Section 7, the determination for bull trout would be "may affect, not likely to adversely affect".
Floodplains	None.	Negligible, adverse, site-specific, and long-term from the temporary, very localized redirection of some water into the channel during high water events. There would be no risk to human safety and no measurable impact to floodplain processes or values.
Recommended Wilderness	Moderate adverse, site-specific and local, and long-term impacts would occur to wilderness character from degradation of the natural condition, unique ecological value, and unique scientific value of recommended wilderness in the upper Akokala Creek drainage from the potential loss of bull and westslope cutthroat trout.	Moderate beneficial, site-specific and local, and long-term impacts to the natural condition and unique ecological and scientific value of recommended wilderness would occur from the protection of native fish populations. Minor adverse, site-specific and local, and short and long-term impacts to solitude and the undeveloped, untrammeled character of recommended wilderness would occur from disturbances during the work period(s), the manipulation of fish passage, and the semi-permanent presence of the structure on the landscape.
Natural Soundscapes	None.	Minor to moderate, adverse, short-term, site-specific and local impacts would occur from noise produced by some motorized equipment and tools, and by approximately three anticipated helicopter flights.

Environmentally Preferable Alternative

According to the CEQ regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative."

Alternative B (Construction of a fish barrier on Akokala Creek below Akokala Lake) is the environmentally preferable alternative for several reasons: 1) Native fish populations and native fish habitat in Akokala Lake and the upper Akokala drainage would be protected for the long-term; 2) one of the last remaining adfluvial bull trout populations and one of the last lakes vulnerable to lake trout invasion in the park would be protected for the long term; 3) the long-term persistence of native fish species would help reflect the overall ecological integrity of the Akokala drainage and the park; 4) valuable opportunities for scientific research of an ecologically sound aquatic system would be maintained; 5) outdoor educational opportunities inherent within a unique and increasingly rare aquatic ecosystem would endure for future generations; and 6) backcountry angling opportunities would remain undiminished by significant changes to fish species composition and abundance.

By contrast, Alternative A (No Action) is not the environmentally preferable alternative because, although there would be no activities that would disturb elements of the biological and physical environment, 1) the integrity and persistence of native fish populations in Akokala Lake and upper Akokala Creek would be threatened by non-native fish species accessing the drainage; 2) if lake trout colonize Akokala Lake, the effects to native fisheries (including bull trout, a threatened species) would be adverse, major and long-term; 3) the overall ecological integrity of Akokala Lake, the upper Akokala drainage, and the park as a whole would be diminished; 4) scientific research, outdoor education, and angling opportunities within the Akokala drainage would be permanently compromised.

Preferred Alternative

No new information came forward from public scoping or consultation with other agencies to necessitate the development of any new alternatives, other than those described and evaluated in this document. Alternative B is the environmentally preferable alternative and best meets the project objectives; therefore, it is also considered the NPS preferred alternative.

Affected Environment and Environmental Consequences

This chapter describes the affected environment (existing setting or baseline conditions) and analyzes the potential environmental consequences (impacts or effects) that would occur as a result of implementing the proposed project. Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity. General definitions are defined as follows, while more specific impact thresholds are given for each resource in Table 4 and at the beginning of each resource section.

- **Type** describes the classification of the impact as either beneficial or adverse, direct or indirect:
    - *Beneficial:* A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
    - *Adverse:* A change that moves the resource away from a desired condition or detracts from its appearance or condition.
    - *Direct:* An effect that is caused by an action and occurs in the same time and place.
    - *Indirect:* An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.
- **Spatial Context** describes the area or location in which the impact would occur. Effects may be 1) *site-specific* – at the location of the action, 2) *local* – on a drainage or district-wide level, 3) *widespread* – throughout the park, or 4) *regional* – outside of the park.
- **Duration** describes the length of time an effect would occur, either short-term or long-term. The definitions for these periods depend upon the impact topic and are described in Table 4.
- **Intensity** describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this EA and are also provided in Table 4.

Cumulative Impact Scenario

The CEQ regulations which implement NEPA require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and preferred alternatives.

Cumulative impacts were determined by combining the impacts of the preferred alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Glacier National Park and, if applicable, the surrounding region. Because the scope of this project is relatively small, the

geographic and temporal scope of the cumulative analysis is similarly small. The geographic scope for this analysis includes actions within the park's North Fork District, while the temporal scope includes projects within a range of approximately ten to fifteen years. Given this, the following projects were identified for the purpose of conducting the cumulative effects analysis, listed from past to future:

Past Actions

Modification and improvement of the Quartz Creek fish passage barrier. In 2012, Glacier National Park improved and completed the construction of a fish passage barrier on Quartz Creek between Middle and Lower Quartz Lakes to protect the upper Quartz drainage and the bull trout population in Quartz Lake from invasive non-native lake trout. The barrier is approximately 100 yards below Middle Quartz Lake, consists of gabions (metal cages) filled with rocks and boulders, and is approximately 75 feet long, 6 feet wide, and 5 feet high.

Experimental lake trout suppression at Quartz Lake. In 2009, the NPS and the U.S. Geological Survey (USGS) began a collaborative and experimental project to remove and control lake trout at Quartz Lake. Radio-tagged lake trout were monitored to identify spawning locations. Spawning concentrations of adult lake trout and juveniles from rearing areas were removed using gill nets. Netting efforts occurred in the spring and fall for greatest efficiency in catching and removing lake trout while minimizing by-catch of non-target fish species. A motorboat equipped with an outboard motor was used to conduct the netting operation. Project staff members were housed at the Quartz Lake patrol cabin near Quartz Lake during netting operations. Peak netting activities occurred during early morning hours and at dusk/night to take advantage of fish behavior. Fuel and other supplies were packed in by livestock and stored onsite. Results of the project to date have been positive; data suggests that the project has already successfully removed a high percentage of spawning adults and thereby reduced the size of the adult lake trout population in Quartz Lake. The experimental project has been proposed to continue for another six to eight years (see Future Actions).

Changes to park fishing regulations. Park fishing regulations were changed in 2008 to allow unlimited harvest of lake trout by anglers.

Replaced boat docks at Kintla and Bowman Lakes. In the spring of 2011, floating boat docks were installed at Kintla and Bowman Lakes to replace the old floating docks, which were disintegrating. The new, plastic-encased docks are removable and will be taken out each fall, stored on shore, and reinstalled in the spring.

Replaced bridge at Kintla outlet. The bridge over Kintla Creek at the Kintla Lake outlet was replaced with a new bridge in the fall of 2011. The timbers for the old bridge were rotten and the bridge would not likely have sustained the next high water event. The bridge had not been replaced for approximately 20 years, and the project was part of cyclic maintenance.

Replaced Bowman Lake footbridge. In 2013, the footbridge at the Bowman Lake outlet, which provides access to the Quartz Lake loop, was replaced with in-kind materials due to wood rot.

Road maintenance and repair along the Inside North Fork Road. Seasonal maintenance along the Inside North Fork Road between Fish Creek and Kintla Lake has included clearing downed timber and obstructive vegetation, replacing log railings on bridges, replacing signage, clearing debris from culverts, and installing new culverts or replacing existing culverts where needed. Most of the new culverts have been installed between Fish Creek and Dutch Creek. Annually, gravel has been hauled in and added to problem areas followed by grading. Riprap material was installed on both sides of the road approximately 1.0 mile (1.6 kilometers) north of the

Anaconda Creek Bridge in response to a high water event in 2006 that washed out part of the road. A secondary channel of Anaconda Creek continues to flood and wash out sections of the road each spring, and road maintenance has occurred annually until more permanent solutions can be implemented. Riprap and culverts have also been used to make interim repairs to a portion of the Inside North Fork Road at Logging Creek, where annual high water during spring has washed out a portion of the road and inundated the nearby campground and ranger station.

On-going Actions

Trail clearing and maintenance. Trails in the project vicinity include the Akokala Creek Trail from the Inside North Fork Road to the Bowman Lake Trail, the Akokala Lake Trail from the Bowman Lake Trail to Akokala Lake, and the Bowman Lake Trail over Numa Ridge between Bowman Lake and Akokala Creek. These trails are cleared annually; the Akokala Lake Trail and Bowman Lake Trail are usually cleared in June, and the Akokala Creek Trail is typically cleared later in the summer as time allows. Clearing generally requires one to two days. Intermittent maintenance of the campground at Akokala Lake generally occurs on a five year, cyclic basis; cyclic work at the campground was last completed in the summer of 2013. Emergency repair and maintenance projects occur as the need arises.

Road maintenance and repair along the Inside North Fork Road. Previously described seasonal and routine maintenance activities along the Inside North Fork Road are ongoing (see Past Actions, above).

Wildlife research and monitoring activity. Bald eagle nests and loon nesting activity at Bowman and Kintla Lakes are monitored from the ground during the nesting season by park staff; non-motorized watercraft may be used during loon and bald eagle nest monitoring. Akokala Lake is monitored for common loon activity.

Boat inspections to protect park waters from aquatic invasive species (AIS). Motorboats and sailboats are thoroughly inspected for AIS (quagga and zebra mussels and other aquatic invasive species) prior to entering park waters. Hand-propelled watercraft users must provide self-certification that their boats are free of AIS. Boats that fail inspection are not permitted in park waters.

Actions the state is taking on the North Fork and other waters. Montana Fish, Wildlife, and Parks is conducting rainbow trout and rainbow-westslope cutthroat trout hybrid suppression actions on the mainstem North Fork Flathead River and a number of its tributaries. These activities are conducted each spring using electrofishing from boats or by crews with backpack electrofishing equipment.

Administrative helicopter flights to Granite Park. Untreated human waste is removed annually from the biological mediation system unit (toilet) that services the Granite Park Chalet. Waste removal occurs in mid to late September and, depending on the amount of waste, requires approximately six round trip flights over a period of a few hours in a single day.

Commercial scenic helicopter air tours. A number of commercial operators currently provide scenic air tours over the park. Such commercial flights over the park occur multiple times each day during peak summer months, but the NPS does not have jurisdiction over the airspace in the park, or over commercial air tour businesses that are located outside the park but provide tours within the park. The Federal Aviation Administration (FAA) recommends that commercial air tour operators fly at least 2000 feet above ground level (AGL) over parks and wilderness areas.

Future Actions

Continued lake trout suppression at Quartz Lake, and lake trout suppression and bull trout conservation at Logging Lake. The NPS is proposing continued lake trout suppression on Quartz Lake and experimental lake trout removal and bull trout conservation in the Logging Lake drainage beginning in 2014. Methods developed on Quartz Lake would be used, lake trout capture and removal techniques would be refined, and the results would be transferrable to other park waters. Bull trout would be translocated within the Logging drainage (from Logging Lake to Grace Lake, for example) as a conservation measure to protect the remaining bull trout, and juvenile bull trout and/or eggs would be collected from Logging Lake and raised in a conservation rearing facility for release back into Logging Lake to boost the population during and/or after lake trout suppression. The project has been proposed for six to eight years.

Future suppression efforts. The NPS may consider additional lake trout suppression efforts in other lakes in the park that support bull trout, depending on the outcome of the Quartz and Logging Lakes projects and an upcoming proposal for a fisheries management plan.

Logging Creek Fish Passage Barrier. The park will consider proposing a fish passage barrier on Logging Creek, downstream of Logging Lake, should lake trout suppression results appear promising. Construction techniques would likely be similar to those used to construct the Quartz Creek fish passage barrier.

Wildlife research and monitoring activity. Bald eagle and loon nest monitoring at Bowman and Kintla Lakes will likely continue. Nests are monitored from the ground during the nesting season by backcountry rangers and park biologists; non-motorized watercraft may be used.

Road maintenance and repair along the Inside North Fork Road. Previously described seasonal and routine road maintenance is anticipated to continue (see Past Actions). During spring runoff, both Anaconda Creek and Logging Creek have repeatedly flooded the Inside North Fork Road and washed away substantial portions of the road. The park is exploring a number of short and long-term options to address the situation.

Additional administrative helicopter flights west of the Continental Divide. Helicopters are used administratively as necessary, and only after rigorous review, to deliver equipment and supplies necessary for backcountry projects and periodic maintenance and rehabilitation of backcountry structures, trails, lookouts, and campsites each year. Flights are not permitted if materials can be transported to the work sites by other methods. Additional helicopter flights west of the Continental Divide are anticipated to deliver supplies and materials to project sites in the backcountry, and to remove waste from Sperry and Granite Park Chalets. The park closely manages the use of administrative flights and has determined that approximately fifty flights per year will not result in measurable effects to park resources (NPS 2003). Glacier National Park conducts an aviation meeting each year with park staff to review and approve or deny flight requests for park projects. Information from this meeting is used to combine flights to reduce the total number of administrative flights. If more than approximately 50 flights are required in a given year, an environmental assessment or impact statement would be prepared.

Emergency response helicopter flights. Helicopter flights in the backcountry could be required for emergencies.

Table 4: Definitions for intensity levels and duration.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Fisheries and Aquatic Threatened Species and Species of Concern (including bull trout and westslope cutthroat trout for the current proposal)	Impacts would be barely perceptible and impact a few individuals of a sensitive species or other native species, or their habitat.	Impacts would affect a relatively small proportion of the population of a sensitive species or other native species, or have very localized impacts upon their habitat. The change would require considerable scientific effort to measure and have minor consequences to the species or habitat function.	Impacts would cause measurable effects on: (1) a moderate number of individuals within the population of a sensitive native species, (2) the existing dynamics between multiple species (e.g., predator-prey), or (3) a moderately sized habitat area or important habitat attributes. A sensitive species or other native species population or their habitat might deviate from existing levels/conditions, but would remain viable indefinitely.	Impacts would have substantial and possibly permanent consequences for a sensitive native species population, the dynamics between multiple native species, or almost all available critical or unique habitats. A sensitive species or other native species population or its habitat would be permanently altered such that their continued survival would be threatened.	Short-term: After implementation, would be expected to recover in 1-5 years. Long-term: Effects would be expected to persist beyond 5 years.
Floodplains	Floodplains and floodplain values would not be affected, or changes would be either non-detectable or if detected, would have effects that would be slight and non-measurable. The change would have barely perceptible consequences to riparian habitat function.	Changes in floodplains and floodplain values would be measurable, although the changes would be small and the effects would be localized. The action would affect a few individual plants or wildlife species within an existing riparian area.	Changes in floodplains and floodplain values would be measurable, long term and on a localized scale. Plant and wildlife species within the existing riparian area would experience a measurable effect, but all species would remain indefinitely viable.	Changes in floodplains and floodplain values would be readily measurable and have substantial consequences to floodplain dynamics and would be noticed on a localized scale within the watershed.	Short-term – After implementation, recovery would last less than one year. Long-term – After implementation, recovery would last more than one year.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Recommended Wilderness	The effect on recommended wilderness character (untrammeled, natural, undeveloped opportunities for solitude or primitive and unconfined recreation and other features, such as cultural) would not be detectable.	The effect would be detectable, but would not appreciably affect the defining attributes of wilderness character as described by the Wilderness Act.	The effect would be readily apparent and/or would appreciably affect the defining attributes of wilderness character as described by the Wilderness Act.	The effects would be highly apparent and would significantly affect the defining attributes of wilderness character as described by the Wilderness Act.	Short-term: Occurs for one year or less. Long-term: Occurs for more than one year or is permanent.
Natural Soundscapes	Noise from the action would be below the level of detection and would not result in any perceptible consequences.	Noise from the action would be localized and rarely audible, and/or would occur for less than 1 month.	Noise from the action would be localized to widespread and periodically audible, and/or would occur for 1 to 3 months.	Noise from the action would be widespread, regularly audible, and/or would occur for more than 3 months.	Short-term: Would occur only during project implementation. Long-term: Would be permanent or occur beyond project implementation.

Fisheries, Bull Trout, and Westslope Cutthroat Trout

Affected Environment

According to the 2006 *Management Policies*, the NPS is responsible for maintaining all animals native to the natural ecosystems of parks, including fish. Additionally, the 2006 *Management Policies* and Director's Order 77 *Natural Resources Management Guidelines* require the NPS to examine the impacts of projects on federally listed species and state listed sensitive species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the USFWS to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats.

The assemblage of fish species above the proposed barrier site consists exclusively of native fish (Table 5). Hybrids between westslope cutthroat trout and rainbow trout have been documented downstream of the proposed barrier site.

Table 5: Fish species present in the Akokala Creek drainage.

Species	Abundance	Native/ Non-native	State-listed	Federally-listed
Westslope cutthroat trout	common	native	Species of concern	
Bull trout	low	native	Species of concern	threatened
Mountain whitefish	common	native		
Sculpin	common	native		

On the west side of Glacier National Park, only 5 of 17 lakes remain secure (due to geologic barriers) from invasion of non-native lake trout (Fredenberg et al. 2007). Three other lakes, including Cerulean, Lincoln, and Akokala, are vulnerable to colonization by lake trout but have not yet been invaded, making protection of Akokala Lake a high priority.

***Bull trout*:** Bull trout (*Salvelinus confluentus*) are listed as threatened under the Endangered Species Act and are also a state listed Species of Concern. Akokala Lake is Critical Habitat for bull trout (USFWS 2010), supports a genetically distinct population of bull trout, and is a critical resource within Glacier National Park. Bull trout are the apex predator of aquatic systems in the park. As such, along with other top, iconic predators such as the grizzly bear, bull trout are representative of the pristine, intact ecological systems for which Glacier National Park is renowned.

Bull trout require habitats offering cold summer water temperatures, complex large woody debris accumulations, and clean cobble and boulder substrates (Rieman and Mcintyre 1993, Rich 1996). Water temperatures greater than 15° C (approximately 60° F) are believed to limit bull trout distribution (Fraley and Shepard 1989). Bull trout have among the lowest upper temperature limits (<21 ^{o}C) and optimal growth temperature (13^{o}C) of North American salmonids (Selong et al. 2001). Clancy (1996) demonstrated a strong relationship between bull trout presence and cold summer water temperatures throughout the Bitterroot National Forest. Bull trout have three distinct life history forms: resident, migratory fluvial and migratory adfluvial (Goetz 1989). Resident populations usually spend their entire lives in small headwater streams, whereas migratory forms are born and reared in small tributary streams for several years before migrating into larger rivers (fluvial) or lakes (adfluvial).

Bull trout begin their spawning migration from Flathead Lake in April, arriving in the North Fork of the Flathead River in June and July. They remain at the mouths of the spawning tributaries for two to four weeks, entering the tributaries from July through September (Fraley

and Shepard 1989). Emigration of juveniles from tributaries into the river/lake system occurs from May through October, peaking during spring and fall months (Downs et al. 2006).

Historically, bull trout were one of four native salmonid species distributed throughout the Flathead drainage. They co-existed with westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), pygmy whitefish (*Prosopium coulteri*), and mountain whitefish (*P. williamsoni*) (Brown 1971). The Flathead Lake bull trout population colonized all three forks of the Flathead River, the Swan River, the Stillwater River, the Whitefish River, and the Lower Flathead River.

Bull trout populations directly associated with Flathead Lake have declined significantly since the early 1980's (Weaver et al. 2006). These declines indicate that recent changes in the foodweb (i.e. introduction and expansion of opossum shrimp, *Mysis diluviana*) and subsequent expansion of lake trout populations throughout the Flathead River basin are the primary threat to bull trout at this time (Spencer et al. 1991, Fredenberg 2002, Ellis et al. 2010, Downs, et al. 2011).

Donald and Alger (1993) evaluated the interaction between introduced lake trout and bull trout in sympatric (same geographical area) waters and concluded there was substantial niche overlap, and that lake trout eventually replace bull trout as the top-level aquatic predator in such systems. They concluded that lacustrine (lake dwelling) populations of bull trout usually cannot be maintained if lake trout are introduced. Data indicate that bull trout populations in most of the large connected glacial lakes on the west side of the park are increasingly imperiled due to the presence of non-native lake trout (Fredenberg 2002, Downs et al. 2011).

Akokala Lake supports a genetically distinct population of bull trout (Meeuwig et al. 2008). Bull trout in Akokala Lake employ a migratory life-history (adfluvial) where they reside as adults in Akokala Lake, migrating upstream into Akokala Creek to spawn. Bull trout redd counts were initiated in 2008 to monitor the population, and since that time have averaged just 5 redds per year. The population appears relatively small; recent bull trout redd survey data suggest a spawning population of less than 20 adults in Akokala Lake. Zero redds were counted in 2013 (Table 6).

Table 6: Bull trout red counts in Akokala Creek, upstream of Akokala Lake (NPS unpublished data).

Year	Number of Redds
2008	11
2009	6
2010	1
2011	4
2012	5
2013	0

Westslope cutthroat trout: Westslope cutthroat trout (*Oncorhyncus clarkii lewisi*) are listed by the state of Montana as a Species of Concern. Westslope cutthroat trout in the Flathead drainage may be adfluvial, fluvial, or resident. Adfluvial fish occupy large lakes in the Upper Columbia drainage and spawn in tributaries. Fluvial fish reside in rivers instead of lakes and utilize tributaries for spawning. Most adults return to the river or lake after spawning. Resident

fish complete their life history in tributary streams and all three life history forms may occur in a single basin.

Westslope cutthroat trout typically begin spawning between the ages of 3 and 5 (Brown 1971, Downs et al. 1997). Migratory adults typically move upstream to spawning tributaries coincident with increasing spring runoff, and spawn as peak spring flows begin to subside (generally in May and June) (Schmetterling 2001, Muhlfeld et al. 2009). Juveniles of the migratory life-history form generally spend one to three years in their natal streams before migrating to the lake habitats; migration of juvenile westslope cutthroat trout is usually associated with high spring flows and generally occurs between May and July (Downs and Jakubowski 2003). Migratory and resident forms may spawn in the same stream systems. Headwater areas are often dominated by resident fish.

Westslope cutthroat trout prefer cold, nutrient poor waters. Aquatic and terrestrial insects are the dominant food source (Brown 1971). Growth rates vary widely but are probably strongly influenced by overall aquatic habitat productivity. Spawning habitat has been characterized as gravel substrates with particle sizes ranging from 2 to 75 millimeters, mean depths ranging from 17 to 20 centimeters, and mean velocities between 0.3 and 0.4 meters per second (Shepard et al. 1984).

Native westslope cutthroat trout are found throughout the Akokala drainage. Akokala Lake supports genetically pure westslope cutthroat trout. Within the last few years, a westslope cutthroat-rainbow trout hybrid was documented migrating into Akokala Creek during springtime (presumably to spawn) and genetic testing of juvenile westslope cutthroat trout in the lower reaches of Akokala Creek has shown that westslope cutthroat-rainbow trout hybridization is beginning to occur in lower Akokala Creek (R. Leary, MFWP, personal communication; Muhlfeld et al. 2009). Hybridization is likely a recent development, however, and the upper portions of the drainage do not appear to be impacted. A genetic survey in Akokala Creek conducted in 2008 (R. Leary, MFWP, personal communication) did not indicate any evidence of hybridization between the Bowman Lake Trail crossing and Akokala Lake.

Intensity Level Definitions

Negligible: Impacts would be barely perceptible and impact a few individuals of a sensitive species or other native species, or their habitat.

Minor: Impacts would affect a relatively small proportion of the population of a sensitive species or other native species, or have very localized impacts upon their habitat. The change would require considerable scientific effort to measure and have minor consequences to the species or habitat function.

Moderate: Impacts would cause measurable effects on: (1) a moderate number of individuals within the population of a sensitive native species, (2) the existing dynamics between multiple species (e.g., predator-prey), or (3) a moderately sized habitat area or important habitat attributes. A sensitive species or other native species population or their habitat might deviate from existing levels/conditions, but would remain viable indefinitely.

Major: Impacts would have substantial and possibly permanent consequences for a sensitive native species population, the dynamics between multiple native species, or almost all available critical or unique habitats. A sensitive species or other native

species population or its habitat would be permanently altered such that their continued survival would be threatened.

Short-term: After implementation, would be expected to recover in 1-5 years.

Long-term: Effects would be expected to persist beyond 5 years.

Impacts of Alternative A – No Action

A decision not to construct a fish passage barrier on Akokala Creek would continue to leave the Akokala Lake bull trout population at risk. Although Akokala Lake appears free of lake trout at this time, the potential exists for lake trout to move upstream into Akokala Lake in the future. There are no known natural fish passage barriers preventing upstream movement between Akokala Creek's confluence with the North Fork of the Flathead River and Akokala Lake (Meeuwig 2008). It is questionable as to whether lake trout would establish a reproducing population in Akokala Lake due to the lake's small size, shallow nature, and an apparent lack of preferred spawning substrate (cobble to small boulder-sized rock with interstitial spaces). However, allowing lake trout to enter and establish residence in the lake could nonetheless have dire consequences for bull trout in Akokala Lake.

Lake trout live considerably longer than either bull or westslope cutthroat trout. Lake trout have been documented to live to over 40 years in some waters (Schram and Fabrizio 1998), whereas migratory bull trout have been documented to live up to age 11 in other regional waters (Downs et al. 2006). Similarly, westslope cutthroat trout in Flathead Basin stream systems have been documented living up to 11 years (Fraley and Shepard 2005). Lake trout predation on bull trout has been documented in the Flathead River/Lake system (Beauchamp 2006). The Akokala Lake bull trout population is genetically distinct and small. Based on recent NPS redd counts (average of 4.5 redds per year), the spawning population is currently likely less than 20 individuals. Akokala Lake is small (22 surface acres) and shallow (less than 30 feet deep), and suitable bull trout habitat would appear limited to the deeper northeastern end, near the lake's inlet. A limited number of juvenile bull trout recruits each year likely support the lake's bull trout population. Any additional predation on juvenile bull trout in this small system poses an unacceptable risk to the population. Sub-adult bull trout would be particularly vulnerable to predation by larger lake trout during winter months when fish may concentrate under the ice in areas of higher oxygen availability (e.g. the stream inlet area) or during summer months when bull trout could be expected to seek the deepest and coolest water. Lake trout would seek similar habitats. Predation by lake trout on juvenile bull trout could push Akokala Lake's genetically distinct bull trout population towards extinction in a relatively short timeframe.

Similarly, Akokala Lake supports adfluvial westslope cutthroat trout. Lake trout are documented to have an adverse impact on native cutthroat trout (Ruzycki et al. 2003)), and lake trout predation would likely reduce or potentially eliminate the adfluvial life-history of westslope cutthroat trout in the lake. The lake would remain open to colonization by other non-native species demonstrated to adversely impact native fish populations. Brook trout, which hybridize with bull trout (Kanda et al. 2002) and compete with westslope cutthroat trout (Peterson et al. 2004) are present in the Middle Fork of the Flathead River and could eventually expand into the North Fork Flathead River drainage and threaten lakes like Akokala. Similarly, rainbow trout are already present in the North Fork Flathead River drainage and are impacting native westslope cutthroat genetic status. A radio-tagged hybrid rainbow-westslope cutthroat trout was documented migrating into lower Akokala Creek in the spring, presumably to spawn (Muhlfeld et al. 2009). Recent genetic surveys (2009) documented hybridized juvenile westslope

cutthroat trout in lower Akokala Creek (MFWP, unpublished data). The hybridization threat is likely fairly recent and headwater areas probably remain free of hybridization at this time. Genetic data collected in 2008 did not detect hybridization in the upper portions of the Akokala Creek drainage (MFWP, unpublished data). However, given sufficient time and the absence of a fish passage barrier, hybridization would likely compromise the adfluvial westslope cutthroat trout population in Akokala Lake.

The no action alternative would adversely impact both bull and westslope cutthroat trout for the long term, not only in the park, but on a regional level. Bull trout abundance in lakes across the west side of the park has declined dramatically, with some populations facing functional extinction (Downs et al. 2011). Lake trout have colonized 9 of 12 accessible park lakes and have dramatically reduced bull trout abundance in almost every lake monitored (Downs et al. 2011). The loss of the Akokala Lake bull trout population would contribute to the demise of bull trout populations on the west side of the park as well as within the larger Flathead River Basin. Glacier National Park supports roughly one-third of the natural (not formed by dams) adfluvial bull trout core areas across their range. The loss of another currently un-impacted population would represent a substantial loss to the species and range-wide conservation efforts. Similarly, secure, native, genetically pure adfluvial westslope cutthroat trout populations are relatively rare and are becoming increasingly threatened across their range by hybridization, competition, and predation. Liknes and Graham (1988) estimated that the distribution and abundance of westslope cutthroat trout populations had declined dramatically and that, at the time of their analysis, the species occupied roughly only 2.5% of their native range in Montana. Recent genetic analyses of westslope cutthroat trout in the park's west side lakes detected little hybridization (R. Leary, Montana Fish, Wildlife, and Parks, personal communication), but many of these lakes are at high risk due to expanding rainbow trout populations in the Flathead River system and a lack of fish passage barriers. Notably, a single hybrid westslope-rainbow trout was recently detected in Cerulean Lake (NPS, unpublished data). The presence of native adfluvial bull trout together with westslope cutthroat trout uncompromised by non-native species is rare both within the park and across both species' range.

Furthermore, climate change will likely add stressors such as warmer water temperatures and changes in hydrology to the park's bull trout and westslope cutthroat trout populations. Akokala Creek is a high elevation drainage that will likely serve as an important habitat refugium for native fish faced with such climate change-induced stressors. Under no action, the creek's effectiveness as a habitat refugium will be considerably decreased due to the presence of non-native invasive fish species.

Cumulative Impacts of Alternative A

Cumulatively, this alternative would likely undermine past, ongoing, and future efforts to conserve native fish populations in the North Fork Flathead River drainage. Actions including the Quartz Creek fish passage barrier, ongoing lake trout suppression at Quartz Lake, potential future lake trout suppression and bull trout conservation at Logging Lake, and rigorous efforts to prevent other aquatic invasive species from entering park waters were/are undertaken to protect bull trout and other native species and are benefitting native fisheries. The no action alternative would compromise the potential benefits of these efforts.

Conclusion

If no action is taken to protect Akokala Lake from invasion by non-native species, the integrity of native fish populations in the lake would be threatened. Akokala Lake is of very high conservation value because it supports migratory bull and westslope cutthroat trout (adfluvial)

and is currently free of non-native species. Under the no action alternative, non-native species such as brook, rainbow, and lake trout would be able to invade Akokala Lake. Given the extent to which lake trout have moved into park lakes, the potential exists for them to reach Akokala Lake, where they would constitute a long-term threat to the lake's genetically distinct bull trout population. In addition, non-native rainbow trout have already begun hybridizing with native westslope cutthroat trout in the lower reaches of Akokala Creek and will likely reach Akokala Lake in the future if access is not precluded. Impacts from the potential loss of Akokala Lake's bull and westslope cutthroat trout populations would be moderate to major, adverse, local and regional, and short and long-term. Cumulatively, no action would compromise past, ongoing, and future efforts to conserve native fish populations in the North Fork drainage; cumulative impacts would be moderate to major adverse, local to regional, and short and long-term.

Impacts of Alternative B – Preferred

This alternative would prevent non-native invasive fish species from entering Akokala Lake. Akokala Lake's genetically distinct bull trout population would be protected for the long term, and the lake's westslope cutthroat trout population would be protected from hybridization with non-native species. This alternative would therefore have long-term benefits to native fish populations in the upper Akokala drainage. Also, climate change-induced habitat alterations that add stressors such as warmer water temperatures and changes in hydrology to native fish populations would not be coupled with the additional stress of the presence of non-native invasive fish species. A fish passage barrier would help safeguard Akokala Creek's high elevation waters as a potential habitat refugium for native fish in the face of climate change.

A fish passage barrier on Akokala Creek would eliminate upstream passage of fish during non-flood conditions (up to a 25-year flow event) and reduce the likelihood of upstream passage during more extreme flood flows. The barrier would consist of a waterfall-type drop, which would increase the water velocity in the center of the channel. Water would fall over the structure and onto a hardened, sloped downstream splash apron. The flow down the sloped apron would make it difficult for fish to swim upstream onto the apron and attempt to jump over the structure. The installation of the barrier is neither permanent nor irreversible if unanticipated consequences occur.

In addition to restricting movement of non-native fish species upstream, the barrier would restrict upstream movement of native species. Due to its location, the structure would have a minimal impact on migratory westslope cutthroat trout movement from Flathead Lake because it would be located upstream of the migratory spawning habitat used by fish from Flathead Lake (C. Muhlfeld, personal communication). Migratory bull trout from Flathead Lake are not known to use lower Akokala Creek for spawning and rearing.

Genetic analysis (Meeuwig 2008) indicates bull trout from Akokala Lake are significantly differentiated from other park bull trout populations. This suggests relatively low levels of movement between the Akokala Lake bull trout population and other nearby bull trout populations. That is, few bull trout from other populations move upstream and into Akokala Lake to contribute genetically to its diversity or augment its population. Immigration into Akokala Lake from other populations on the order of one individual every bull trout generation (six-seven years for bull trout) is not likely to substantially impact Akokala Lake population demographics. Based on the genetics data, the risk of isolation from a genetics perspective appears low in the near and medium term, but could be a concern in the long term. Assisted migration of bull trout from below the barrier or other nearby/genetically similar bull trout populations into the lake would be used to maintain appropriate genetic diversity, should

genetic monitoring suggest this approach is necessary. We would take a similar approach in monitoring westslope cutthroat trout genetics. Mills and Allendorf (1996) proposed a general "rule of thumb" of between one and ten migrants into a subpopulation per generation as appropriate for maintaining genetic diversity.

Migratory westslope and bull trout from Akokala Lake would continue to have access to their primary spawning areas located upstream of Akokala Lake and the barrier site. Fish would still be free to move downstream through the project area, and downstream connectivity would not be impacted. Because the proposed barrier location is near the upper end of the drainage, adverse impacts on upstream fish movement would likely be minimal. Furthermore, any risks to native fish populations due to isolation would likely occur gradually over a prolonged period of time, while the negative impacts of non-native fish are considerably more urgent, near term, and less theoretical. As indicated, potential genetic consequences from isolation can be mitigated by periodically moving some individual native fish upstream over the barrier to augment the population in Akokala Lake. Migratory westslope cutthroat trout inhabiting Flathead Lake or the North Fork Flathead River would still have access to the majority of the Akokala drainage for spawning and rearing.

Sediment releases, which could harm fish, caused by in stream disturbances during the project would be minimal since construction would occur during the late-summer/fall low water period. In addition, most of the substrate in the project area consists of very large cobble and boulders. However, during construction a park employee would be at the construction site to monitor sediment releases. If these releases are deemed excessive (highly unlikely given the large substrate material), the activity would be halted until the stream clears. At that time, work activities would proceed. The proposed project would not change water temperatures.

The matrix checklist and supporting documentation for the biological assessment indicate that the Akokala Creek fish barrier project may affect but would not likely adversely affect the listed bull trout. There is a negligible probability of "take" of ESA listed bull trout or native westslope cutthroat trout. Modification (in the form of a fish barrier) of proposed critical habitat would not take place because the barrier is located downstream of Akokala Lake. The impact of minor temporary sediment pulses during construction has a negligible probability to impact bull trout and/or bull trout habitat in the Akokala Creek drainage.

Cumulative Impacts of Alternative B

Results of experimental lake trout suppression efforts at Quartz Lake have so far been promising. Alternative B combined with ongoing and possible future lake trout suppression, as well as other projects designed to protect bull trout populations, would benefit bull trout and other native fish species for the long term.

Conclusion

Construction of a fish passage barrier would greatly reduce the ability of non-native fish to enter Akokala Lake, and would therefore have moderate, long-term, site-specific to regional beneficial impacts on native fish populations in the drainage. Adverse impacts to native fisheries from disturbances to the stream bed during construction of the barrier and isolation of the lake would be minor, short and long-term, and site-specific to local. Under Section 7 of the Endangered Species Act, the determination of effect for bull trout would be "may affect, but not likely to adversely affect". Cumulatively, the action alternative would further the benefits of ongoing and possible future lake trout suppression efforts as well as other projects; the cumulative impacts to fisheries would be beneficial, moderate, long-term, and local to regional.

Floodplains

Affected Environment

Floodplains are a very important component of a stream's natural processes. They slow and disperse the energy of floodwaters, providing diverse habitat for wildlife and plants that thrive on flood disturbance. Large woody debris and fine river sediment collects in floodplains, increasing biodiversity. Executive Order 11988 Floodplain Management requires all federal agencies to "avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative". The NPS is guided by the 2006 *Management Policies* and Director's Order 77-2 *Floodplain Management*, which provides guidance on how to implement Executive Order 11988. The Service will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director's Order 77-2 *Floodplain Management*, certain construction within a 100-year floodplain requires preparation of a statement of findings (SOF) for floodplains.

Akokala Creek drains a glacially carved lake, Akokala Lake, and flows approximately 18 km before entering the North Fork of the Flathead River approximately 3km north of Polebridge. Akokala Lake is approximately 22 acres in size and has a maximum depth of approximately 23 feet. Hydrology in the Akokala Creek basin is snowmelt driven with peak flows typically occurring between April and June, although mid-winter rain-on-snow events can occur and produce floods of considerable magnitude. The contributing drainage area for the Akokala Creek watershed has been estimated at 26,272 acres and the annual precipitation estimated at 74 inches. Based on methods outlined in the USGS Water Resources Investigations Report 03-4308, a flood frequency analysis was conducted for the Akokala Creek watershed (Tables 7 and 8) (Mike Jensen, DJA, personal communication).

Table 7: Flood frequency analysis results for the Upper Akokala Creek barrier site (Mike Jensen, DJA, personal communication).

Drainage Area (Sq. Mi.)	Recurrence interval (years)	Discharge (cubic feet per second)
6.4	2	215
	10	406
	50	824
	100	1,190

Table 8: Flood frequency analysis results for the Lower Akokala Creek barrier site (Mike Jensen, DJA, personal communication).

Drainage Area (Sq. Mi.)	Recurrence interval (years)	Discharge (cubic feet per second)
7.6	2	228
	10	442
	50	904
	100	1,310

Bankfull width at the upper barrier site was estimated at 37 feet, while it was estimated at 25 feet at the lower site. The upper site is located at a dramatic break in channel gradient just

downstream of the outlet of Akokala Lake, transitioning from a 1.3% slope just upstream of the project area to 5.5% immediately downstream of the project site. The average slope through the project area at the lower site was measured at 2.7% (Mike Jensen, DJA, personal communication). Both potential barrier sites are located in relatively confined valley types, but the upper site is confined by steep valley side slopes to a greater degree and has greater structural channel control.

NPS infrastructure in the drainage is limited and consists of a small backcountry campground at the foot of Akokala Lake, a footbridge over the creek and a vehicle bridge along the Inside North Fork Road over Akokala Creek, approximately 11 miles downstream of the Akokala Lake outlet.

Intensity Level Definitions

Negligible: Floodplains and floodplain values would not be affected, or changes would be either non-detectable or if detected, would have effects that would be slight and non-measurable. The change would have barely perceptible consequences to riparian habitat function.

Minor: Changes in floodplains and floodplain values would be measurable, although the changes would be small and the effects would be localized. The action would affect a few individual plants or wildlife species within an existing riparian area.

Moderate: Changes in floodplains and floodplain values would be measurable, long term and on a localized scale. Plant and wildlife species within the existing riparian area would experience a measurable effect, but all species would remain indefinitely viable.

Major: Changes in floodplains and floodplain values would be readily measurable and have substantial consequences to floodplain dynamics and would be noticed on a localized scale within the watershed.

Short-term: After implementation, recovery would last less than one year.

Long-term: After implementation, recovery would last more than one year.

Impacts of Alternative A – No Action

There would be no action under this alternative that would change existing conditions; consequently, there would be no impacts to floodplains under Alternative A.

Cumulative Impacts of Alternative A

There would be no action under this alternative, and no cumulative impacts.

Conclusion

Under no action, there would be no change to existing floodplain conditions along Akokala Creek, and no impacts.

Impacts of Alternative B – Preferred

The completed fish barrier proposed under this alternative would not modify or occupy the Akokala Creek floodplain in such a way that it would measurably affect flood flows. The structure would funnel water to the center of the channel over a drop that would prevent fish from passing upstream during most flows. During flows in excess of bankfull, some water that would normally be up on the floodplain would be directed back into the channel due to the presence of the approximately five to ten foot high barrier structure extending out onto the

floodplain. However, due to the confined valley types, the floodplain is naturally narrow where the barrier would likely be located (as well as at the alternate site), and impacts to floodplain function would be negligible. Immediately downstream of the barrier, the stream would have unimpeded access to the floodplain once again. The flood storage capacity and overall dynamics of the floodplain would not be affected. No floodplain dikes or similar water control structures would be involved in this project. A splash pad on the downstream side of the structure would reduce any erosion potential.

The stream would have access to its floodplain immediately upstream and downstream of the structure. The completed structure would impact floodplain function over perhaps four to six feet (thickness of the structure) of an estimated 58,000 feet of stream channel extending from the project area downstream to the bottom of the drainage. Because the stream would continue to have access to its floodplain, and since the effects of the completed barrier would not be measurable and would occur in a very localized area of Akokala Creek, adverse impacts to floodplains would be negligible. Additionally, since the work would be completed during the late summer/fall at low water times, any impact to the floodplain during construction would be remediated by spring flows.

There are no site-specific flood risks, as the project is located in the backcountry and well away from any developed areas. Any downstream flood risk associated with potential failure of the barrier would be attenuated immediately downstream of the structure. The barrier would not necessarily be a permanent fixture on the landscape, and could be removed in the future if the NPS determined it is no longer needed. We modeled water surface elevations to determine the extent to which the stream surface elevation would be raised in an upstream direction (and potentially impact the Akokala Lake campground) following construction of the barrier. During baseflow periods (summer and winter), water surface elevations at the campground would only be a few inches higher than they are currently (Figure 9). During typical annual spring high water, it is also unlikely that water surface elevations at the campground would be noticeably impacted. Modeling suggests that a temporary rise in water level adjacent to the campground may be observed in an extreme high water event (100 year flood), but it would be minor, amounting to approximately 15 inches during a 100-year peak flood event (Figure 10). The campground is located approximately six feet in elevation above the water surface at baseflow.

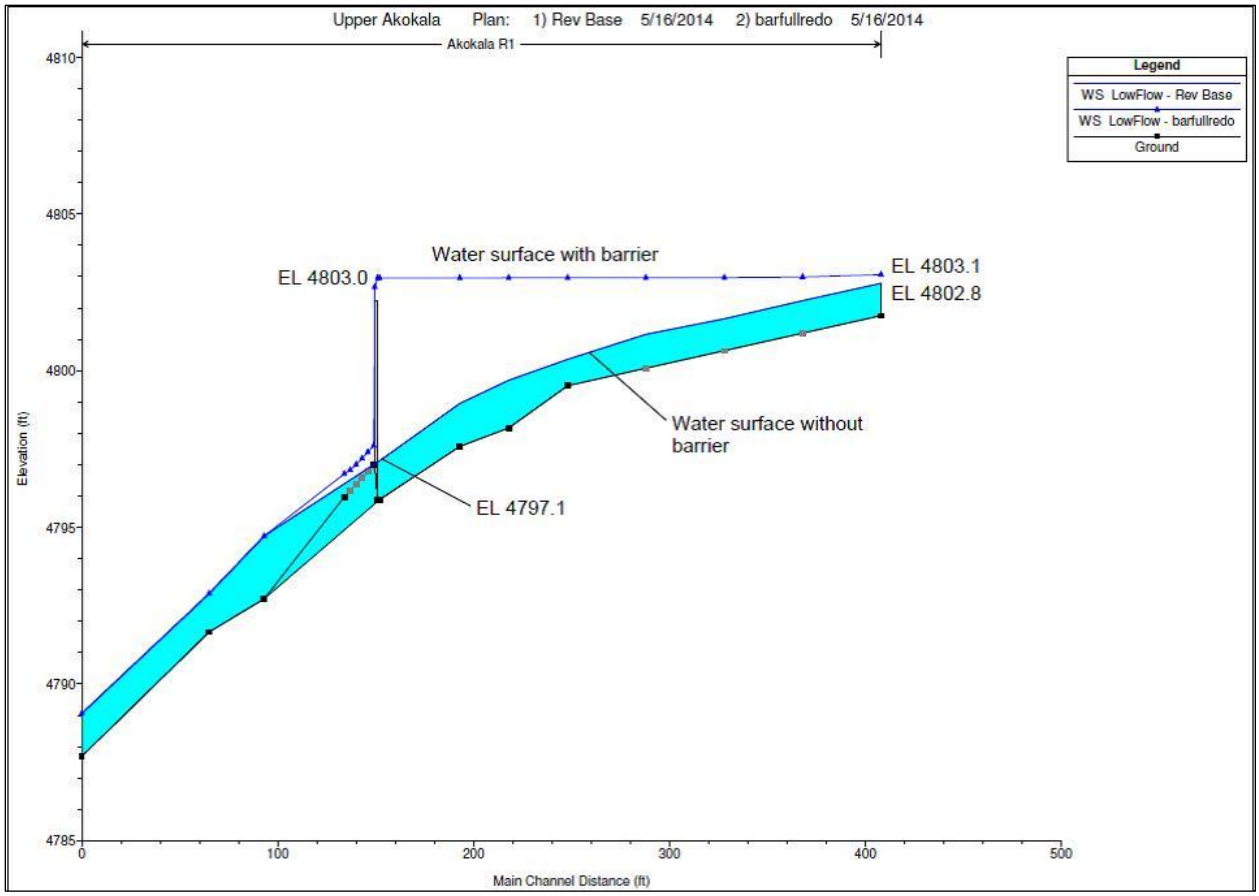

Figure 9: Modeled water surface elevations with and without a fish barrier as a function of distance from the barrier at base flow (25 cubic feet per second). The Akokala Lake Campground is located at the upper end of the surveyed reach.

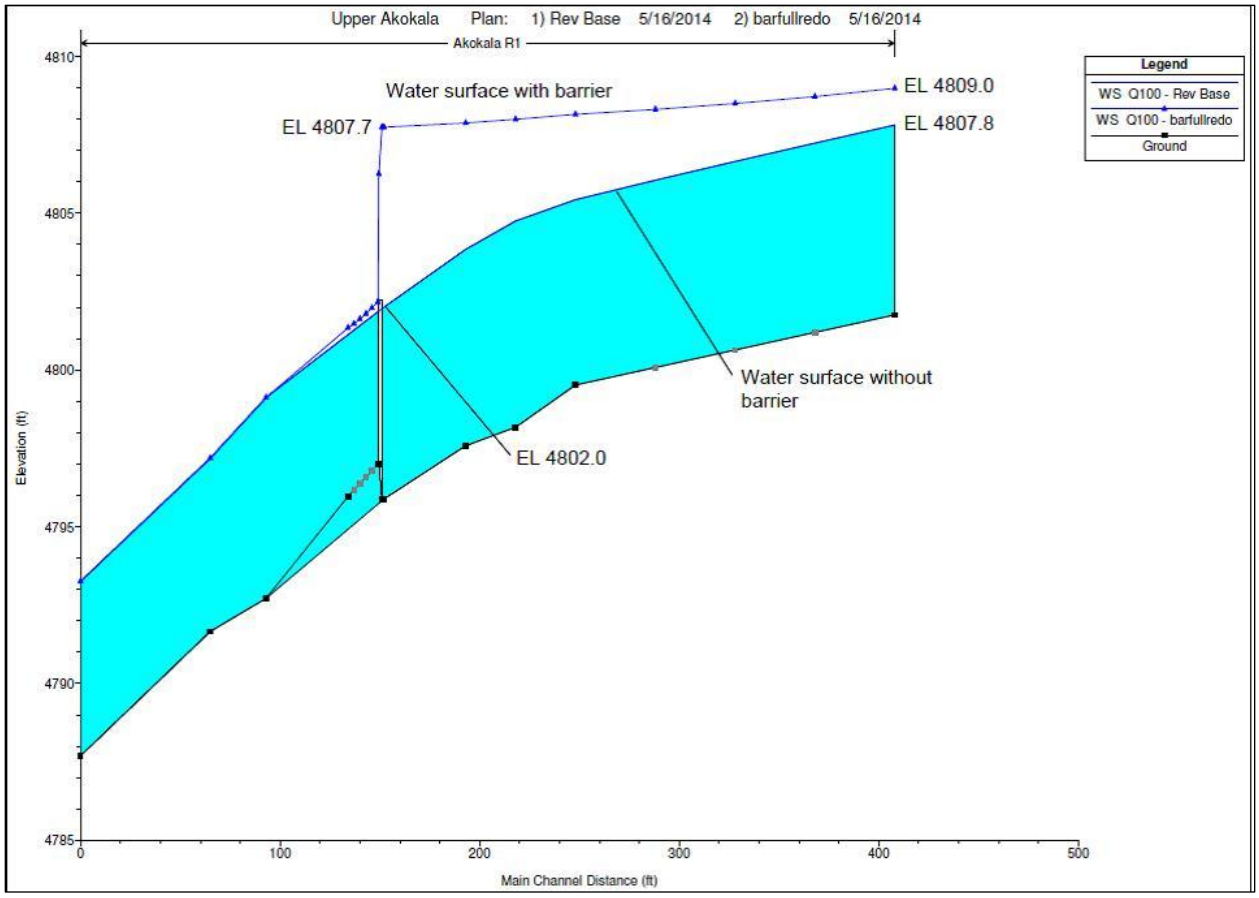

Figure 10: Modeled water surface elevations with and without a fish barrier as a function of distance from the barrier for a 100-year flood event. The Akokala Lake Campground is located at the upper end of the surveyed reach.

Cumulative Impacts of Alternative B

A fish passage barrier on Akokala Creek combined with the recently improved and modified fish passage barrier on Quartz Creek and past, ongoing, and future road, trail, and facility maintenance projects in the North Fork district would have a negligible, incremental increase in overall impacts to floodplains on a district-wide (or local) level.

Conclusion

Under Alternative B, the completed fish barrier would not affect the overall dynamics of the Akokala Creek floodplain. During high water events, the structure would temporarily redirect some water that would otherwise occupy the floodplain back into the channel, but the stream would have unimpeded access to its floodplain immediately downstream of the barrier. Any effects would occur in a very localized area and would not be measurable. Impacts to floodplains would therefore be adverse, negligible, site-specific, and long-term. Cumulatively, the proposed project combined with the Quartz Creek barrier, a possible future barrier on Logging Creek, and road, trail, and facility maintenance in the North Fork district would not measurably increase impacts to floodplains; cumulative impacts would be adverse, negligible or less, local, and long-term. Because there would be no risk to human safety and no measurable impact to floodplain processes or values, a statement of findings for floodplains has not been prepared.

Recommended Wilderness

Affected Environment

In 1964, Congress passed the Wilderness Act to "assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition" [Section 2(a)]. The National Wilderness Preservation System was thus established, preserving millions of acres of undeveloped wild country across a diversity of landscapes in the nation's wildlife refuges, forests, and national parks.

The defining attributes of wilderness as described by the Wilderness Act [Section 2(c)] include: "untrammeled"; "undeveloped Federal land retaining its primeval character and influence"; "without permanent improvements or human habitation"; "protected and managed so as to preserve its natural conditions"; "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable"; "has outstanding opportunities for solitude or a primitive and unconfined type of recreation"; "has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition"; and "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value".

In 1974, Glacier National Park completed a study and environmental impact statement to comply with the Wilderness Act. That document resulted in the recommendation by the Secretary of the Interior that over 90% of the park be designated as wilderness. Amendments to the wilderness recommendation in 1984 and 1994 increased the amount of proposed wilderness in the park to 95%. Glacier National Park manages recommended wilderness as designated wilderness in accordance with NPS management policies (2006). Wilderness management guidelines promote natural processes and allow humans only as temporary visitors.

Recommended wilderness in Glacier National Park begins 100 feet from the centerline of paved and unpaved roads, and 300 feet from developed areas (DO #41 and NPS 2004). (This is per a recent revision to the park's recommended wilderness boundary in accordance with DO #41; under the previous boundary, recommended wilderness began 200 feet from the centerline of paved roads and 50 feet from unpaved roads.) The park's recommended wilderness remains "untrammeled" and relatively unmanipulated, with landscapes that have retained their intrinsically wild character and persist in their essentially natural condition. The park's recommended wilderness provides outstanding opportunities for solitude and primitive recreation, such as hiking, backcountry camping, canoeing/kayaking, and mountaineering. Much of the park's wilderness resource is characterized by features and attributes of unique value, including scenic landscapes, cultural resources that reflect the park's history, educational settings for students of all ages, and areas that provide valuable opportunities for scientific research. Human developments consist of trails and associated constructions such as bridges and turnpikes, backcountry campsites, and historic lookouts and cabins. There are no permanently occupied structures, most of the park's recommended wilderness is trail-less, and motorized use and access is prohibited except in the case of emergency or administrative purposes necessary for the management of wilderness. Administrative activity is generally limited to trail and campsite maintenance, preservation of historic structures, invasive species control, and fish and wildlife management and research.

West of the Continental Divide in the park's North Fork District, recommended wilderness within the Akokala drainage is untrammeled, characterized by rugged, remote, and wild

country, spectacular scenery, and a diverse assemblage of native plants and animals. The drainage is natural, except for the presence of non-native lake trout and rainbow trout, and the project area is undeveloped. Many visitors come to the area to experience a sense of solitude and enjoy numerous recreational opportunities, including hiking and backcountry camping. The wilderness resource in the Akokala drainage also offers unique opportunities for outdoor education, and the lake provides important opportunities for scientific research on intact terrestrial and aquatic ecological systems, including those which support native fish species and a genetically distinct population of bull trout.

Intensity Level Definitions

Negligible: The effect on recommended wilderness character (untrammeled, natural, undeveloped opportunities for solitude or primitive and unconfined recreation and other features, such as cultural) would not be detectable.

Minor: The effect would be detectable, but would not appreciably affect the defining attributes of wilderness character as described by the Wilderness Act.

Moderate: The effect would be readily apparent and/or would appreciably affect the defining attributes of wilderness character as described by the Wilderness Act.

Major: The effects would be highly apparent and would significantly affect the defining attributes of wilderness character as described by the Wilderness Act.

Short-term: Occurs for one year or less.

Long-term: Occurs for more than one year or is permanent.

Impacts of Alternative A – No Action

Failure to construct the fish barrier under the no action alternative would increase the potential for native fish populations to become compromised or permanently lost as a result of colonization by non-native fish, and would adversely affect certain wilderness defining attributes of the Akokala drainage. The natural, historic state of the native fish community and the ecological condition of the drainage would become permanently altered as non-native fish species predominate over native fish. Such a profound alteration of the fishery would degrade the unique ecological value of the Akokala drainage, where the threatened bull trout still resides at the top of the food chain. The Akokala drainage would not be safeguarded as habitat refugia for native fish species in the face of climate change, and the unique scientific and educational value of the drainage would be diminished by the loss of opportunities to study and monitor a completely native fish species assemblage. Some recreational opportunities would also be impacted, as changes to fish species composition and distribution would alter the dynamics of lake and stream fishing. Adverse impacts to the wilderness resource would extend throughout the lower and upper Akokala drainage and would be long-term and likely permanent.

Cumulative Impacts of Alternative A

No action would undermine the overall goal of past, ongoing, and future efforts to suppress lake trout and reduce access for non-native fish species elsewhere in the North Fork (such as at Quartz Creek), which would eventually degrade the natural condition of recommended wilderness on a district-wide scale. This combined with past, ongoing, and future actions (such as backcountry helicopter flights and trail and facility maintenance involving motorized equipment) that may adversely impact other wilderness defining attributes would incrementally increase the overall level of adverse impacts to the wilderness resource.

Conclusion
Taking no action to construct the fish barrier on Akokala Creek would result in the permanent degradation of the natural condition, unique ecological value, and unique scientific and educational value of recommended wilderness in the Akokala drainage. Impacts to recommended wilderness would be adverse, moderate, site-specific and local, and long-term. Cumulatively, no action combined with short-term disturbances from past, ongoing, and reasonably foreseeable actions would incrementally increase adverse effects to the overall quality of recommended wilderness, and would diminish the overall benefit of efforts to protect the native fish community elsewhere in the North Fork district. Cumulative impacts would be adverse, negligible to moderate, short and long-term, site-specific and local.

Impacts of Alternative B – Preferred

Constructing a fish barrier on Akokala Creek under Alternative B would protect the native fish community in the Akokala drainage and thus benefit the natural condition of the park's recommended wilderness. The unique ecological, scientific, and educational value of the wilderness resource within the Akokala drainage would be safeguarded for the long term, and recreational fishing opportunities would remain unaltered. Additionally, by protecting one of the park's high elevation watersheds against non-native invasive fish species, the barrier would help ensure the availability of critical habitat refugia for native species in the face of climate change.

During implementation of the preferred alternative, the use of some motorized tools and equipment would temporarily disturb the solitude and the undeveloped quality of recommended wilderness within and near the project area. Helicopters would disrupt these attributes along the drainage; noise from helicopters would be transient along the flight path, very short term, and would likely only occur one to three times during the first year of work, depending on the number of necessary flights (helicopter support would not be anticipated during the second year of work). Overall, noise from the project would be intermittent and short-term, ceasing once the barrier is constructed.

Construction could occur over two field seasons, for approximately four to five weeks the first year and possibly one to two weeks the following year. Any second year work would likely create a level of noise and activity similar to that caused by trail maintenance routinely underway in the park's backcountry. Slight adverse impacts to soils and vegetation from work crews travelling to and from the work site would have negligible, temporary, negative effects to the area's natural quality. The low number of trees (estimated at 30) that would be used for the barrier would also slightly affect the unmanipulated and natural quality of the area surrounding the work site. Regeneration of young trees is a rapid process in the moist climate of the North Fork of the Flathead River drainage and any trees removed for the project would eventually be naturally replaced. The use of "roller logs" to haul the logs over the ground would considerably lessen impacts to the work site, as vegetation would not be destroyed but only temporarily compacted. The removal of the logs would also occur some distance from the trail, and would not be apparent to hikers. Clearing brush between the trail and the work site for work crew access would have slight, temporary adverse impacts to the unmanipulated quality of the immediate area, but evidence of clearing would likely not be apparent by the following spring.

Because it would manipulate (block) upstream fish passage, the barrier would result in a manipulation of the community of life, and would therefore adversely affect the untrammeled quality of recommended wilderness in the Akokala drainage. The barrier would also be a semi-permanent human-made structure on the wilderness landscape, diminishing the undeveloped

quality of the immediate area for the long term. Because the barrier's location is well away from the Akokala Lake Trail, is difficult to reach, and is not visible from the trail, it would be detected only by visitors who venture off the trail and bushwhack to the creek. Infrequent future maintenance (possibly every seven-ten years) of the barrier is not anticipated to require helicopter support and would have only negligible adverse impacts on recommended wilderness.

Cumulative Impacts of Alternative B
Disturbances during the project combined with past, ongoing, and future actions (such as facility and trail maintenance involving motorized equipment, lake trout suppression activities, administrative flights and possible emergency flights to backcountry sites near the project area, as well as commercial scenic flights on the west side of the divide) would temporarily and incrementally increase the level of disturbance to recommended wilderness character. Any helicopter flights for this project would be included in the park's annual restricted administrative flight quota of approximately 50 flights. The presence of the barrier combined with other past, ongoing and future actions would have adverse long term impacts to the untrammeled and undeveloped wilderness qualities of the project area. However, combined with other efforts in the North Fork district to suppress lake trout and inhibit non-native fish from accessing park waterways, the preferred alternative would benefit the long-term natural character and unique ecological, scientific, and educational value of the wilderness resource in the park.

Conclusion
By protecting native fish populations in the Akokala drainage, Alternative B would appreciably benefit the natural condition and unique ecological, scientific, and educational value of wilderness, resulting in long-term, moderate, site-specific and local beneficial impacts. The barrier would also help ensure the availability of habitat refugia for native fish species in the face of climate change. Temporary disturbances from motorized equipment and transport during construction, impediments to upstream fish migration and the semi-permanent presence of a human-made structure would have impacts to wilderness qualities (untrammeled, undeveloped, and opportunities for solitude) that are adverse, site-specific, local, and both short and long-term. Adverse impacts would be minor since they would not appreciably affect the overall wilderness character of the area. Future maintenance of the barrier would result in negligible adverse, short-term impacts. Cumulatively, disturbances from Alternative B would temporarily and incrementally increase disturbances from past, ongoing, and reasonably foreseeable actions and have minor adverse, short and long-term, site-specific and local impacts on wilderness. But the project would further the benefit of other efforts to protect native fisheries, resulting in beneficial cumulative impacts to recommended wilderness that are minor to moderate, long-term, and local.

The MRDG used for the minimum requirement-minimum tool analysis for this alternative is included in Appendix A.

Natural Soundscapes

Affected Environment

An important part of the NPS mission is to preserve the natural soundscapes of national parks. Natural soundscapes are the sounds of nature, a diminishing resource in an ever modernizing world. Natural sounds have intrinsic value as part of the unique environment of Glacier National Park, and they predominate throughout most of the park. Glacier's natural soundscape

includes the pervading quiet and stillness, low decibel background sounds, birdsong and animal calls, the buzz of insects, and the sound of wind, rain, and water, among many others. Natural soundscapes vary across the park, depending on elevation, proximity to water, vegetative cover, topography, time of year, and other influences.

In general, soundscapes in the park are managed according to the management objectives for the park's four different management zones (backcountry, rustic, day use, and visitor service). Existing ambient sound levels differ within each of these zones, and therefore soundscape management objectives for each zone are also different. Soundscapes for the park's backcountry and rustic zones differ markedly from the soundscapes within visitor service zones. Day use zones often overlap between rustic or backcountry zones, and soundscapes in these areas may be characteristic of both the backcountry and more developed areas.

According to the park's *General Management Plan* (NPS 1999), management in backcountry areas (which includes recommended wilderness) is focused on protection and, when necessary, restoration of resources and natural processes. Backcountry zones, where natural sounds predominate, are therefore managed for natural quiet. The rustic zone is managed to provide a staging area for use of the adjacent backcountry zone; facilities and campgrounds are primitive, and natural sounds also predominate. In contrast, visitor service and day use zones allow for heavier use and more congested conditions, and some level of human caused, artificial noise is expected. Soundscapes in day use zones are managed for a range of conditions that include some noise as well as natural quiet, depending on their location in the park, while visitor service zones are managed for higher levels of human caused noise.

Noise intrusions can mask biologically important sounds, degrade habitat, and cause behavioral and physiological changes in wildlife, and can interfere with visitors' experience of quietude or other qualities of the natural soundscape. The effects of noise typically diminish as the distance from the source of the noise increases. However, depending on sound frequencies and environmental factors, noise intrusions can contribute to overall background noise over very large distances, even if they are not distinctly audible.

A short segment of lower Akokala Creek is within the rustic zone where it is crossed by the Inside North Fork Road. Otherwise, Akokala Creek is entirely within the park's backcountry management zone, within the conifer forest acoustic zone, which has natural ambient sound levels ranging between 19.4 and 30.5 dBA (USDOT 2009). Natural ambient sound levels at Akokala Creek are likely midway within this range, at approximately 25 dBA, given predominating natural stream sounds and as suggested by specific sound level data obtained at similar measurement sites within the conifer forest acoustic zone (U.S. DOT 2009). The natural soundscape in the Akokala drainage is characterized almost exclusively by natural sounds and is interrupted only now and then by hiking parties, aircraft (including scenic air tours), or park administrative activities such as trail and backcountry campground maintenance.

Intensity Level Definitions

Negligible: Noise from the action would be below the level of detection and would not result in any perceptible consequences.

Minor: Noise from the action would be localized and rarely audible, and/or would occur for less than 1 month.

Moderate: Noise from the action would be localized to widespread and periodically audible, and/or would occur for 1 to 3 months.

Major: Noise from the action would be widespread, regularly audible, and/or would occur for more than 3 months.

Short-term: Would only occur during project implementation.

Long-term: Would be permanent or occur beyond project implementation.

Impacts of Alternative A – No Action

There would be no action under this alternative, and therefore no new impacts to the natural soundscape.

Cumulative Impacts of Alternative A

Because no action would be taken, there would be no additional cumulative impacts to natural sounds under Alternative A.

Conclusion

No action would be taken under Alternative A, and there would be no impacts to natural soundscapes.

Impacts of Alternative B – Preferred

The preferred alternative would cause temporary, intermittent disturbances to the natural soundscape from helicopter flights and the use of some motorized tools and equipment, including chainsaws, an electric rock drill, one or two water pumps, a generator, and possibly a small electric concrete mixer. Most of the noise would be localized to the work site, but helicopter noise would be highly audible and affect a greater area; tools with lower frequencies could also produce noise that is audible beyond the project area. Motorized tools and equipment would produce noise ranging between approximately 65 and 110 dBA one meter from the source: the generator would produce noise at approximately 68.5 dBA one meter from the source; water pumps would produce noise at approximately 105 dBA one meter from the source; chainsaws would produce noise at approximately 110 dBA one meter from the source; the electric concrete mixer would produce noise at approximately 65-75 dBA one meter from the source; and the electric rock drill would produce little noise (similar to a typical hand-held electric drill).

The audibility of noise beyond the project area would be dampened and minimized by topography, weather conditions, and vegetation. There would also be a higher natural ambient sound level in the project area due to natural stream sound, which would cause noise to attenuate over shorter distances. Additionally, the use of motorized equipment would be minimized as much as possible and would only occur intermittently. The water pumps may not be necessary. If they are, the pumps could be running intermittently every day during the project, depending on site conditions, how readily water is diverted from the immediate work area, and the overall progress of construction. If used, the concrete mixer would run intermittently over the course of the construction period.

Noise from the generator, chainsaws, concrete mixer, and water pumps could have some adverse effects to wildlife and visitors within and near the project area. In general, artificial noise can mask biologically important sounds, degrade habitat, and cause behavioral and physiological changes in individual animals. However, these effects would likely be very localized since the noise would diminish as distance from the site increases.

Helicopter noise would be highly audible and disruptive to the soundscape within the Akokala drainage and possibly side tributaries as the helicopter flies from the staging area up to the work

site. Helicopter noise could temporarily displace animals, cause behavioral and physiological changes, and mask important sounds. The noise could also disrupt opportunities for visitors to experience a sense of quiet and solitude in the backcountry. However, helicopter noise from the project would be transient and very temporary, no more than three short (approximately 45 minute round trip) flights would be anticipated on two different days, and adverse effects to the natural soundscape from helicopters would be minor. Helicopter support would not be anticipated during second year work, but would have a similar level of impact if it occurred.

Overall, the introduction of artificial noise under the preferred alternative would be intermittent and temporary. The project is expected to be completed in four to five weeks the first year, with a possible one to two week work period the following year. Second year work would likely produce a similar level of noise as ongoing backcountry trail maintenance. Work would be underway during daylight hours only, with no disturbances to nighttime soundscapes. When onsite noise is produced, it would not occur continuously, but would be interrupted by periods of relative quiet when crews are doing work that does not require motorized tools or equipment. Once the project is complete, there would be no impacts to the natural soundscape.

Cumulative Impacts of Alternative B

Noise associated with the fish barrier's construction combined with past, ongoing, and future actions (such as facility and trail maintenance, lake trout suppression activities, administrative flights and possible emergency flights to backcountry sites near the project area, as well as commercial scenic flights on the west side of the divide) would temporarily and incrementally increase impacts to the natural soundscape. Helicopter flights for this project would be included in the park's annual restricted administrative flight quota of approximately 50 flights or less.

Conclusion

Noise from helicopter flights and some motorized equipment would have temporary adverse effects to natural soundscapes within and near the project area, and would disturb wildlife and visitors. However, artificial noise would be intermittent and short-term and would be interrupted by periods of quiet. Topography, forest vegetation, natural stream sounds, and weather conditions would minimize the audibility of the noise, and the effects would diminish as distance from the work site increases. Helicopter noise would be transient, very temporary, and of short duration. The proposed action would be completed in four to five weeks during one work session and possibly one to two weeks during a second work session the following year. Adverse impacts to the natural soundscape would therefore be minor to moderate, short-term, site-specific and local. Cumulatively, noise from the fish barrier construction combined with impacts from past, ongoing, and reasonably future actions would have minor to moderate, adverse, short and long-term, site-specific and local impacts to natural soundscapes.

Compliance Requirements

National Environmental Policy Act (NEPA) and Regulations of the Council on Environmental Quality – The National Environmental Policy Act applies to major federal actions that may significantly affect the quality of the human environment. This generally includes major construction activities that involve the use of federal lands or facilities, federal funding, or federal authorizations. This EA meets the requirements of the NEPA and the Council on Environmental Quality in evaluating potential effects associated with activities on federal lands. If no significant effects are identified, a finding of no significant impacts (FONSI) would be prepared. If significant effects are identified, a notice of intent (NOI) would be filed for preparation of an environmental impact statement (EIS).

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) – Section 7 of the Endangered Species Act is designed to ensure that any action authorized, funded, or carried out by a federal agency likely would not jeopardize the continued existence of any endangered or threatened plant or animal species. If a federal action may affect threatened or endangered species, then consultation with the U.S. Fish and Wildlife Service is required. The NPS has determined that the proposed action "**may affect, but is not likely to adversely affect**" **bull trout** and **grizzly bears** and **"is not likely to jeopardize" wolverines**; the NPS has determined **"no effect" to Canada lynx, water howellia, and Spalding's catchfly.** In accordance with Section 7, the NPS has initiated informal consultation with the USFWS. Separate biological assessments addressing the effects to fisheries and grizzly bears have been prepared and sent to the USFWS.

Clean Water Act (CWA) and State and Local Water Quality and Floodplain Regulations – If the preferred alternative is implemented, all necessary federal, state and local permits would be obtained to ensure compliance with the Clean Water Act.

Executive Order 11990, Protection of Wetlands – E.O. 1190 was issued in 1977 "…to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative…". A survey conducted in 2013 determined that wetland vegetation is not present at either of the possible sites being considered for this project. Wetlands would therefore not be affected, and a statement of findings for wetlands has not been prepared.

Executive Order 11988, Floodplain Management – E.O. 11988 requires all federal agencies to "avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative". According with Director's Order 77-2, the impacts of proposed actions within the 100-year floodplain must be addressed in a separate Statement of Findings (SOF). The structure would not modify or occupy the floodplain in such a way that it would affect flood flows. There would be no risk to human safety, and no measurable impacts to floodplain processes or values. Therefore, a statement of findings for floodplains has not been prepared.

Wilderness Act – the Wilderness Act of 1964 (16 USC 1131 et seq.) established a wilderness preservation system. Public law 88-577 established a national wilderness preservation system and describes wilderness with the following:

> A wilderness…is…an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean… an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which: 1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; 3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and 4) may also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

A Minimum Requirement Decision Guide was prepared for this project and is included in Appendix A.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et seq.)— Section 106 of the National Historic Preservation Act of 1966 (as amended) requires all federal agencies to consider effects from any federal action on cultural resources eligible for or listed in the National Register of Historic Places (NHRP) prior to initiating such actions. During scoping, Glacier National Park notified the Montana State Historic Preservation Office (SHPO), the Confederated Salish and Kootenai Tribes, and the Blackfeet Tribal Business Council of the project in keeping with 36 CFR800. There are no historic buildings and structures or cultural landscapes are in the project area, the Areas of Potential Effect have been surveyed for archeological resources and none were identified, neither the Blackfeet Tribe nor the Confederated Salish and Kootenai Tribes raised concerns about the proposed action, and no historic properties would be affected. The NPS will document a "no historic properties affected" when this EA is transmitted to the Montana SHPO.

Consultation and Coordination

Internal and External Scoping

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an EA. Glacier National Park conducted both internal scoping with park staff and external scoping with the public and interested and affected groups and agencies. The scoping process helped identify potential issues, alternatives, the possible effects of cumulative actions, and what resources would be affected.

Public scoping began on August 3, 2012 and the comment period closed on September 4, 2012. A press release was distributed to several media outlets and a scoping brochure was mailed to individuals and organizations on the park's EA mailing list, including members of Congress and various federal, state, and local agencies. An email announcement was sent to a number of interested parties, with a link to the brochure on the NPS Planning, Environment, and Public Comment (PEPC) website.

Eleven comment letters were received during scoping. Six letters were from private individuals with no organization affiliation, three letters were from organizations (Flathead Valley Trout Unlimited, National Parks Conservation Association, and Backcountry Horsemen of the Flathead), one letter was from the Army Corps of Engineers, and one was from the Montana Department of Environmental Quality. Eight letters were supportive of the proposal to construct a fish passage barrier, and one expressed appreciation for notification of the project but declined to comment on the basis of it being outside their expertise. Letters from the Army Corps of Engineers and the Montana Department of Environmental Quality addressed the need for applicable state and federal water permits. Scoping comments and responses are included under *Alternatives, Suggestions, and Concerns from Public Scoping.*

Agency Consultation

In accordance with Section 7 of the Endangered Species Act (ESA), Glacier National Park initiated informal consultation with the USFWS on August 3, 2012. A biological assessment (BA) has been prepared and submitted to the USFWS along with this EA. The NPS has determined that the proposed Akokala Creek fish passage barrier **may affect but is not likely to adversely affect** grizzly bears and bull trout, is **not likely to jeopardize** wolverines, and would have **no effect** on Canada lynx, water howellia, and Spalding's catchfly.

On August 3, 2012, Glacier National Park also notified the Montana SHPO in keeping with 36 CFR800. The NPS will document a "no historic properties affected" in the EA transmittal letter.

In accordance with Section 404 of the Clean Water Act, Glacier National Park also notified the U.S. Army Corps of Engineers (USACE) of the project on August 3, 2012. The USACE responded with a letter on August 21, 2012 stating that the proposed project will require a permit; all necessary permits will be obtained if the preferred alternative is implemented.

Native American Consultation

Glacier National Park also notified the Confederated Salish and Kootenai Tribes and the Blackfeet Tribal Business Council on August 3, 2012, in accordance with 36 CFR800. Neither the Blackfeet Tribe nor the Confederated Salish and Kootenai Tribes (CSKT) raised concerns about the proposed action during scoping for this project. The barrier's proposed location was changed from the bridge along the Inside North Fork to a site downstream of Akokala Lake, and the park discussed this change with the CSKT in March of 2013. The tribe did not raise concerns about the changed location.

Environmental Assessment Review and List of Recipients

This EA is subject to a 30-day public comment period. The public was notified of the EA availability through news releases to a number of state and local media outlets and a letter and or document to various agencies, tribes, groups businesses and individuals who have asked to receive notification or are otherwise required to get notification. The document will be available for review on the park's planning website at http://parkplanning.nps.gov/AkokalaFishBarrier. Copies of the EA will be provided to other interested individuals upon request.

During the 30-day public review period, the public is encouraged to submit their written comments to the NPS, as described in the instructions at the beginning of this document. Following the close of the comment period, all public comments will be reviewed and analyzed prior to the release of a decision document. The NPS will issue responses to substantive comments received during the public comment period.

List of Preparers

Chris Downs, Fisheries Biologist—Co-team captain, purpose and need/introduction/background, alternatives and project description; fisheries, aquatic threatened and endangered species and species of concern; water resources, floodplains, agency consultation, document review
Kyle Johnson, Wilderness Manager—recommended wilderness section
Lon Johnson, Cultural Resource Specialist—Cultural resources sections, SHPO consultation
Mary Riddle, Chief of Planning and Environmental Compliance—NEPA compliance, technical adequacy and document review, guidance with agency consultation
Amy Secrest, Environmental Protection Assistant—co-team captain; purpose and need/introduction/background; recommended wilderness; natural soundscapes; agency consultation; technical writing/editing and document compilation/formatting; coordination of EA schedule and review
John Waller, Wildlife Biologist—Threatened and Endangered Species and Species of concern

Consultants

Lisa Bate, Lead Wildlife Sciences Technician, GNP	*Dawn Lafleur, IPM/Restoration Biologist, GNP*
Matt Boyer, Fisheries Biologist, MFWP	*Sven Leon, P.E., FHWA*
Mark Biel, Natural Res. Program Manager, GNP	*Clint Muhlfeld, Ph.D., Aquatic Ecologist, USGS*
Vin D'Angelo, Fisheries Biologist, USGS	*Frank Turina, Ph.D., NPS Natural Sounds Program*
Scott Emmerich, North Fork District Ranger, GNP	

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

References

Anderson, S., W. Johnson, D. Roberts, B. Summerfield, K. Swisher, B. Conard, B. Holt, A. Vandehay. 2009. Guide to effects analysis of helicopter use in grizzly bear habitat. Montana/Northern Idaho Level I Terrestrial Biologists Team. Final version, September 17, 2009.U.S. Forest Service and U.S. Fish and Wildlife Service.

Beauchamp, D., M. Kerschner, N. Overman, J. Rhydderch, J. Lin, and L. Hauser. 2006. Trophic interactions of nonnative lake trout and lake whitefish in the Flathead Lake food web. Report to the Confederated Salish-Kootenai Tribes.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books, Montana State University, Bozeman, MT. 207 pages.

Clancy, P. 1996. Statewide Fisheries Investigations. Montana Department of Fish, Wildlife, and Parks, Fisheries Division, Job Completion Report, Project F-46-R-4, Helena, Montana.

Donald, D. B. and D. J. Alger. 1993. Geographic distribution, species displacement, and niche overlap for lake trout and bull trout in mountain lakes. Canadian Journal of Zoology 71:238-247.

Downs, C. C., R. G. White, B. B. Shepard. 1997. Age at sexual maturity, sex ratio, fecundity, and longevity of isolated headwater populations of westslope cutthroat trout. North American Journal of Fisheries Management 17: 85-92.

Downs, C. C. and R. Jakubowski. 2003. 2002 Lake Pend Oreille/Clark Fork River Fishery Research and Monitoring Progress Report. Report to Avista Corporation by the Idaho Department of Fish and Game. Boise.

Downs, C. C., D. Horan, E. Morgan-Harris, and R. Jakubowski. 2006. Spawning demographics and juvenile dispersal of an adfluvial bull trout population in Idaho. North American Journal of Fisheries Management 26:190-200.

Downs, C. C., H. Langner, C. Stafford, and C. C.Muhlfeld. 2011. Glacier National Park Fisheries Inventory and Monitoring Annual Report, 2009-2010. National Park Service, Glacier National Park, West Glacier, Montana.

Ellis, B. K. and nine co-authors. 2010. Long-term effects of a trophic cascade in a large lake ecosystem. PNAS 1013006108.

Federal Register, 2013. Endangered and threatened wildlife and plants; threatened status for the distinct population segment of the North American wolverine occurring in the contiguous United States. A proposed rule by the U.S. Fish and Wildlife Service on 2/4/2013. https://www.federalregister.gov/articles/2013/02/04/2013-01478/endangered-and-threatened-wildlife-and-plants-threatened-status-for-the-distinct-population-segment. Accessed 2/15/2013.

Fraley, J. J. and Shepard, B.B. 1989. Life history, ecology, and population status of migratory bull trout (*Salvelinus confluentus*) in the Flathead Lake and River system, Montana. Northwest Science 63:133-143.

Fraley, J. J. and Shepard, B. B. 2005. Age, growth, and movements of westslope cutthroat inhabiting the headwaters of a wilderness river. Northwest Science 79:12-21.

Fredenberg, W. 2002. Glacier National Park, Flathead Drainage Lake Survey and Fish Passage Evaluation. U.S. Fish and Wildlife Service, Creston Fish and Wildlife Center, Kalispell, MT.

——. 2003. *Fredenberg. W.* Further evidence that lake trout displace bull trout in mountain lakes. Intermountain Journal of Sciences 8(3):1-11.

Fredenberg, W., M. Meeuwig, and C. Guy. 2007. Action plan to conserve bull trout in Glacier National Park. USFWS, Creston, Montana.

Goetz, F. 1989. Bull trout life history and habitat study. Final Report to the Deschutes National Forest, USFS Contract 43-0466-9-1371. Oregon State University, Eugene, Oregon.

Hartman, H. C. 2012. Proceedings of a workshop on climate change scenario planning for the Crown of the Continent Ecosystem, 9-10 March 2010, Whitefish, Montana. Arid Lands Information Center, University of Arizona, Tucson, AZ. A report submitted in partial fulfillment of DSCESU Cooperative Agreement Number H2623050831.

Intergovernmental Panel on Climate Change (IPCC). 2007: Summary for policymakers. In: *Climate change 2007: The physical science basis.* Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Kanda, N., R. F. Leary, and F. W. Allendorff. 2002. Evidence of introgressive hybridization between bull and brook trout. Transactions of the American Fisheries Society. 131:772-782.

Liknes, G. A. and P. J. Graham. 1988. Westslope cutthroat trout in Montana: life history, status, and management. American Fisheries Society Symposium 4:53-60.

Mace, R. D., J. S. Waller, T. L. Manley, K. Ake, W. T. Wittinger. 1999. Landscape evaluation of grizzly bear habitat in Western Montana. Conservation Biology 13(2): 367-377.

Meeuwig, M. H. 2008. Ecology of lacustrine-adfluvial bull trout populations in an inter-connected system of natural lakes. Ph.D. Dissertation. Montana State University, Bozeman.

Mills, L. S. and F. W. Allendorf. 1996. The one-migrant-per-generation rule in conservation and management. Conservation Biology 10:1509-1518.

Montana Natural Heritage Program (MNHP). 2011a. Montana Field Guide. Montana Natural Herigate Program and Montana Fish, Wildlife and Parks. Retrieved on July 20, 2011, from http://FieldGuide.mt.gov.

_____. 20011b. Montana Field Guide. Montana Natural Herigate Program and Montana Fish, Wildlife and Parks. Retrieved on January 12, 2012, from http://fieldguide.mt.gov/detail_AMACC05030.aspx.

_____. 2013. Species of concern data report. Montana Natural Heritage Program, Natural Resource Information System, Montana State Library, Helena, MT. Report date: October 29, 2013.

Muhlfeld, C. C., T. E. McMahon, D. Belcer, J. L. Kershner. 2009. Spatial and temporal spawning dynamics of native westslope cutthroat trout, *Oncorhynchus clarkii lewisi*, introduced rainbow trout, *Oncorhynchus mykiss*, and their hybrids. Canadian Journal of Fisheries and

Aquatic Sciences, 2009, 66:(7) 1153-1168.

Muhlfeld, C. C., V. D'Angelo, S. T. Kalinowski, E.L.Landguth, C. C. Downs. J. Tohtz, and J. L. Kershner. 2012. A fine scale assessment of using barriers to conserve native stream salminds: A case study in Akokala Creek, Glacier National Park, USA. The Open Fish Science Journal 2012(5)9-20.

Muhlfeld, C. C., R. P. Kovach, L. A. Jones, R. Al-Chokhachy, M. C. Boyer, R. F. Leary, W. H. Lowe, G. Luikart, and F. W. Allendorf. Invasive hybridization in a threatened species is accelerated by climate change. Nature Climate Change, Letters. Published online: 25 May 2014. DOI: 10.1038/NCLIMATE2252.

National Park Service (NPS). 1993. Glacier National Park: Resource management plan. Glacier National Park, West Glacier, MT.

_____. (NPS). 1999. Final general management plan and environmental impact statement for Glacier National Park. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

_____. 2003. Environmental assessment to conduct additional administrative helicopter and fixed wing flights in 2003. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

_____. 2004. Final commercial services plan and final environmental impact statement, Glacier National Park. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

_____. 2006. NPS management policies. U.S. Department of the Interior, National Park Service, Washington, D.C.

_____. 2009. Large-scale removal of lake trout in Quartz Lake, environmental assessment. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

_____. 2010. Bear management plan, Glacier National Park. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

_____. 2012. Quartz Creek fish barrier modification and improvement, environmental assessment and statement of findings – floodplains. U.S. Department of the Interior, National Park Service, Glacier National Park, West Glacier, MT.

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

Rich, C. 1996. Influence of abiotic and biotic factors on the occurrence of resident bull trout in fragmented habitats in western Montana. M.S. Thesis. Montana State University, Bozeman, MT.

Rieman, B. E. and McIntyre, J. D. 1993. Demographic and habitat requirements for conservation of bull trout. USDA Forest Service, General Technical Report INT-302, Intermountain Research Station, Ogden, Utah.

Rowley, B. 2013. Akokala Creek fish barrier archeological project report. Glacier National Park, West Glacier, Montana.

Ruzycki, J. R., D.A. Beauchamp, and D.L. Yule. 2003. Effects of introduced lake trout on native cutthroat trout in Yellowstone Lake. Ecological Applications (13) 23-37.

Schmetterling, D. A. 2001. Seasonal movements of fluvial westslope cutthroat trout in the Blackfoot River drainage, Montana. North American Journal of Fisheries Management (21)507-520.

Schram, S. T. and M. C. Fabrizio. 1998. Longevity of Lake Superior lake trout. North American Journal of Fisheries Management (18): 700-703.

Selong, J. H., T. E. McMahon, A.V. Zale, and F.T. Barrow. 2001. Effect of temperature on growth and survival of bull trout, with an application for an improved method to determine thermal tolerance in fishes. Transactions of the American Fisheries Society. 130: 1026-1037.

Shepard, B. B., Pratt, K. L., and Graham, P. J. 1984. Life histories of westslope cutthroat trout and bull trout in the upper Flathead River basin, Montana. Report to the Environmental Protection Agency, Contract R008224-01-5. Montana Department of Fish, Wildlife and Parks, Helena, MT.

Spencer, C. N., B. R. McClelland and J. A. Stanford. 1991. Shrimp stocking, salmon collapse and eagle displacement: cascading interactions in the foodweb of a large ecosystem. Bioscience 41: 14-21.

U.S. Department of Transportation (USDOT). 2009. Baseline ambient sound levels in Glacier National Park. U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division, RTV-4F Acoustics Facility, Cambridge, MA. 213 pages.

U.S. Fish and Wildlife Service (USFWS). 2010. Bull trout final critical habitat. http://www.fws.gov/pacific/bulltrout/CriticalHabitat.html. Accessed October 3, 2011.

Weaver, T., M. Deleray, and S. Rumsey. 2006. Flathead Lake and River System Fisheries Status Report. DJ Report No. F-113-R-1-R-4, SBAS Project No. 3130, Montana Fish, Wildlife, and Parks, Kalispell, Montana.

Williams, J. E., A. L. Haak, H.N. Neville, and W.T. Colyer. 2009. Potential consequences of climate change to persistence of cutthroat trout populations. North American Journal of Fisheries Management 29: 533-548, American Fisheries Society.

Wright, P. L. 1950. *Synaptomys borealis* from Glacier National Park, Montana. General notes in Journal of Mammalogy, 31(4):460. American Society of Mammalogists. http://www.jstor.org/stable/1375116. Accessed January 26, 2012.

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Appendix A:

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE WORKBOOK

"…except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act…"

-- The Wilderness Act of 1964

Project Title: **Akokala Creek Fish Passage Barrier**

MRDG STEP 1

Determine if Administrative Action is Necessary

Description of the Situation

What is the situation that may prompt administrative action?

Glacier National Park contains about one third of the natural lake core areas supporting migratory bull trout (native adfluvial populations) in the U.S., yet is losing these populations to invasive, non-native lake trout. Lake trout have invaded 9 of 12 accessible lakes on the west side of the park, threatening the persistence of bull trout populations. Lake trout displace bull trout when introduced, and data shows this occurring in park lakes. Without action, these ecologically unique bull trout populations face continued decline and functional extinction. Glacier National Park is critically important in range-wide conservation and recovery of bull trout, which are listed as threatened under the Endangered Species Act (ESA). The National Park Service (NPS) has statutory responsibilities under the ESA to assist in bull trout recovery. Akokala Lake, located in the backcountry of the park's North Fork District, supports bull trout as well as westslope cutthroat trout, a state listed species of concern. Bull trout in Akokala Lake are genetically distinct from other bull trout west of the Continental Divide, and genetic testing suggests genetically pure westslope cutthroat trout are present within the upper and lower Akokala drainage. Non-native fish affect native fish populations through predation, hybridization, and competition. In waters where they are introduced, lake trout generally replace bull trout as the dominant aquatic predator. Akokala Lake is one of three known remaining lakes in the park that lake trout have not colonized. As a direct tributary of the North Fork of the Flathead River, however, the Akokala drainage is susceptible to invasion, not only by lake trout, but also by rainbow and possibly brook trout. The NPS is proposing to build a fish passage barrier on Akokala Creek to prevent this from happening. The intent is to conserve native fish populations in Akokala Lake by preventing colonization by non-native species.

Options Outside of Wilderness
Can action be taken outside of wilderness that adequately addresses the situation?

☐ YES **STOP – DO NOT TAKE ACTION IN WILDERNESS**

☒ NO **EXPLAIN AND COMPLETE STEP 1 OF THE MRDG**

Explain:

Akokala Lake is located in recommended wilderness. We completed a drainage-wide survey for potential barrier sites, and all feasible sites identified are located within the recommended wilderness boundary.

Criteria for Determining Necessity
Is action necessary to meet any of the criteria below?

A. Valid Existing Rights or Special Provisions of Wilderness Legislation

*Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that **requires** action? Cite law and section.*

☐ YES ☒ NO

Explain:

There are no applicable existing rights or special provisions.

B. Requirements of Other Legislation

Is action necessary to meet the requirements of other federal laws? Cite law and section.

☒ YES ☐ NO

Explain:

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 (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."

NPS Management Policy 4.4.1 states, "The NPS will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems". This policy further states the NPS will accomplish this by "preserving and restoring the natural abundances, diversities, dynamics...of native plant and animal species...and the ecosystems in which they occur."

NPS Management Policy 4.4.1.2 states "The Service will strive to protect the full range of genotypes of native plant and animal populations..."

NPS Management Policy 4.4.2.2 states "The Service will strive to restore extirpated native plant and animal species..."

NPS Management Policy 4.4.2.3 states "The Service will survey for, protect, and strive to recover all species native to national park service system units....listed under the Endangered Species Act".

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

NPS Management Policies 4.4.4.2 states "All exotic plant and animal species...will be managed up to and including eradication".

NPS Management Policies 6.3.7 states "Without...indigenous and endemic species...a wilderness experience would not be possible... Natural resource plans will be integrated...with wilderness management plans.... Management should seek to sustain natural distribution, numbers...of indigenous species."

C. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character, including: Untrammeled, Undeveloped, Natural, Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation, or Other Features of Value?

UNTRAMMELED

☐ YES ☒ NO

Explain:

Action is not necessary to preserve the untrammeled character of recommended wilderness in the Akokala drainage. Taking action would adversely affect the untrammeled character of the area for the long term through manipulation of the "community of life".

UNDEVELOPED

☐ YES ☒ NO

Explain:

Action is not necessary to preserve the undeveloped character of recommended wilderness in the Akokala drainage. Taking action would adversely affect the undeveloped character of the area for the long term due to the presence of the barrier structure.

NATURAL

☒ YES ☐ NO

Explain:

The project is necessary to preserve the natural attributes of wilderness character in the Akokala drainage. If no action is taken, native fish populations will likely be compromised or permanently lost as a result of non-native fish predation, competition, and hybridization. The natural, historic condition of the native fish communities and the ecological integrity of the upper Akokala Lake drainage could become permanently altered as non-native fish species predominate over native fish. Such a profound alteration of these backcountry fisheries would degrade the natural condition and unique ecological value of the Akokala Creek drainage, where the threatened bull trout still resides at the top of the food chain.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

☒ YES ☒ NO

Explain:

Action is not necessary to preserve most opportunities for solitude and primitive recreation in the Akokala drainage. Action would, however, preserve recreational angling opportunities, which would be impacted if no action is taken since changes to fish species composition and distribution would alter the dynamics of lake and stream fishing in the drainage. Taking no action could cause a reduced abundance of westslope cutthroat trout, the primary species caught by anglers in Akokala Lake; anglers would no longer be able to fish for genetically pure westslope cutthroat trout. Anglers would likely experience more difficulty in catching fish, and the quality of the recreational angling experience and the diversity of recreational opportunities overall would be diminished.

Opportunities for solitude could be temporarily affected by human activity during construction of the barrier. The long term presence of the barrier could also affect opportunities for solitude for those whom encounter the structure.

OTHER FEATURES OF VALUE

☒ YES ☐ NO

Explain:

Action is necessary to preserve the unique scientific, educational, and ecological value of recommended wilderness in the Akokala drainage. Without action, the ecological integrity of the Akokala drainage would become permanently altered, threatening the area's unique ecological value, including the long-term availability of important habitat refugia (i.e. free of invasive non-native species) for native species in the face of climate change. Additionally, the unique scientific and educational value of the Akokala drainage would be diminished, as opportunities to study and monitor a fully functioning native aquatic species assemblage would be lost.

Step 1 Decision
Is administrative action necessary in wilderness?

Decision Criteria

A.	Existing Rights or Special Provisions	☐ YES	☒ NO
B.	Requirements of Other Legislation	☒ YES	☐ NO
C.	Wilderness Character		
	Untrammeled	☐ YES	☒ NO
	Undeveloped	☐ YES	☒ NO
	Natural	☒ YES	☐ NO
	Outstanding Opportunities	☒ YES	☒ NO
	Other Features of Value	☒ YES	☐ NO

Is administrative action necessary in wilderness?

☒ YES	**EXPLAIN AND PROCEED TO STEP 2 OF THE MRDG**
☐ NO	**STOP – DO NOT TAKE ACTION IN WILDERNESS**

Explain:

Akokala Lake and most of Akokala Creek (99+ percent) are located in recommended wilderness. We evaluated building the barrier outside of the recommended wilderness boundary, but the engineering analysis indicated this would not result in an effective barrier. Therefore the project must occur in recommended wilderness. Action is necessary under statutory responsibilities of the ESA, the NPS Organic Act, Glacier National Park's enabling legislation, and NPS Management Policies. Action is also necessary to preserve the natural character, recreational fishing opportunities, and the unique scientific, ecological, and educational values of the upper Akokala Lake drainage.

MRDG STEP 2

Determine the Minimum Activity

Other Direction

*Is there "special provisions" language in legislation (or other Congressional direction) that explicitly **allows** consideration of a use otherwise prohibited by Section 4(c)?*

AND/OR

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

☒ YES **DESCRIBE DOCUMENTS & DIRECTION BELOW**

☐ NO **SKIP AHEAD TO COMPONENTS OF THE ACTION BELOW**

Describe Documents & Direction:

According to the Action Plan to Conserve bull trout in Glacier National Park (developed by the U.S. Fish and Wildlife Service and Montana State University to conserve the long-term abundance, distribution, and genetic diversity of bull trout in the park), Akokala Creek would be "among the highest priorities for consideration of placement of a fish passage barrier" to protect bull trout.

Conservation of the park's native wildlife is specifically mentioned in Glacier National Park's enabling legislation.

The NPS Organic Act charges the NPS with conserving natural resources in an unimpaired state for future generations.

The park's General Management Plan includes conservation of native species and management/control of non-native species.

NPS Management Policies (2006) contains many policies that directly address removing invasive species to protect native species.

The Wilderness Section of NPS Management Policies (2006) also places a high priority in conserving native species as an important part of wilderness.

The Crown Managers Partnership Strategic Plan (2011-2015) includes the facilitation and support of "collaborative actions by agencies, communities, and stakeholders to maintain and/or restore ecological health" to the Crown of the Continent Ecosystem.

Components of the Action

What are the discrete components or phases of the action?

Component X:	*Example: Transportation of personnel to the project site*
Component 1:	Transport personnel to and from the site.
Component 2:	Transport equipment/supplies to and from the site.
Component 3:	Build the barrier.
Component 4:	Durability of the barrier.
Component 5:	Tools used to build the structure.

Proceed to the alternatives.

Refer to the **MRDG Instructions** regarding alternatives and the effects to each of the comparison criteria.

MRDG STEP 2: Alternative 1

Alternative 1: No Action

Description of the Alternative
What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?

No action would be taken; a fish passage barrier would not be constructed.

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

Component of the Action		Activity for this Alternative
X	*Example: Transportation of personnel to the project site*	*Example: Personnel will travel by horseback*
1	Transport personnel to and from the site.	Personnel would not travel to and from the site.
2	Transport equipment/supplies to and from the site.	Equipment and supplies would not be transported to the site.
3	Build the barrier.	The structure would not be built.
4	Durability of the barrier.	Not applicable
5	Tools used to build the structure.	No tools would be used.

Wilderness Character
What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?

UNTRAMMELED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒

1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☐	☒
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	0	NE
Untrammeled Total Rating		**0**		

Explain:

Taking no action would not affect the untrammeled quality of wilderness character in the Akokala drainage.

UNDEVELOPED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☒	☐
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	-1	NE
Undeveloped Total Rating		**-1**		

Explain:

Taking no action would not directly affect the undeveloped quality of wilderness character in the Akokala drainage. The absence of a barrier, however, could indirectly affect the undeveloped quality for the long-term if non-native invasive lake trout enter Akokala Lake and result in the need for potentially disruptive motorized gill netting and removal operations.

NATURAL

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☒	☐

4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	1	NE
Natural Total Rating		**-1**		

Explain:

There would be no effect to the natural condition of recommended wilderness from the absence of personnel, equipment and supplies. But the absence of a fish passage barrier would adversely affect the natural condition of recommended wilderness in the Akokala drainage as previously described (see Step 1). Native fish populations would likely be compromised or permanently lost as a result of non-native fish predation, competition, and hybridization. The natural condition of the native fish communities and the ecological integrity of the upper Akokala Lake drainage could become permanently altered as non-native fish species predominate over native fish.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☒	☒
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	1	NE
Solitude or Primitive & Unconfined Rec. Total Rating		**-1**		

Explain:

There would be no effect to the solitude or primitive recreation from the absence of personnel, equipment and supplies. The absence of a fish barrier would not directly affect solitude, nor most recreational opportunities. No action could indirectly affect opportunities for solitude, however, if non-native invasive lake trout enter Akokala Lake and result in potentially disruptive motorized gill netting and removal operations. The absence of a fish barrier would adversely affect recreational angling opportunities in the Akokala drainage, however, as previously described (see Step 1). Taking no action could cause a reduced abundance of westslope cutthroat trout, the primary species caught by anglers in Akokala Lake. Anglers would no longer be able to fish for genetically pure westslope cutthroat trout, and would likely experience more difficulty in catching fish.

OTHER FEATURES OF VALUE

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒

1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☒	☐
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	1	NE
Other Features of Value Total Rating		**-1**		

Explain:

There would be no effect to other features of value from the absence of personnel, equipment and supplies. But the absence of a fish barrier would adversely affect unique scientific, educational, and ecological values of the Akokala drainage as previously described (see Step 1). Without a barrier to prevent non-native fish species from invading Akokala Lake, the unique scientific and educational value of the Akokala drainage would be diminished, as opportunities to study and monitor a fully functioning native aquatic species assemblage would be lost. The ecological integrity of the Akokala drainage would become permanently altered, threatening the area's unique ecological value, including the long-term availability of important habitat refugia (i.e. free of invasive non-native species) for native fish species in the face of climate change.

Other Criteria

What is the effect of each component activity on other comparison criteria? What mitigation measures will be taken?

MAINTAINING TRADITIONAL SKILLS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☐	☒
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	0	NE
Maintaining Traditional Skills Total Rating		**0**		

Explain:

No action would neither diminish nor maintain proficiency in the use of traditional or primitive skills.

SPECIAL PROVISIONS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☐	☒
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	0	NE
Special Provisions Total Rating		**0**		

Explain:

No special provisions are applicable.

ECONOMICS & TIME CONSTRAINTS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☒	☐
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	1	NE
Economics & Time Constraints Total Rating		**-1**		

Explain:

The absence of a barrier would allow non-native invasive lake trout to enter Akokala Lake, which could result in costly and time consuming gill netting and removal operations.

Safety of Visitors & Workers

What is the effect of each component activity on the safety of visitors and workers? What mitigation measures will be taken?

SAFETY OF VISITORS & WORKERS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would not travel to and from the site.	☐	☐	☒
2	Equipment and supplies would not be transported to the site.	☐	☐	☒
3	The structure would not be built.	☐	☐	☒
4	The barrier's durability would not be applicable (N/A).	☐	☐	☒
5	No tools would be used.	☐	☐	☒
Total Number of Effects		0	0	NE
Safety of Visitors & Workers Total Rating		**0**		

Explain:

Because there would be no action, safety would not be applicable and there would be no effect.

Summary Ratings for Alternative 1

Wilderness Character	
Untrammeled	0
Undeveloped	-1
Natural	-1
Solitude or Primitive & Unconfined Recreation	-1
Other Features of Value	-1
Wilderness Character Summary Rating	**-4**

Other Criteria	
Maintaining Traditional Skills	0
Special Provisions	0
Economics & Time Constraints	-1
Other Criteria Summary Rating	**-1**

Safety	
Safety of Visitors & Workers	0
Safety Summary Rating	**0**

MRDG STEP 2: Alternative 2

Alternative 2: Construct the fish passage barrier using only hand tools, transport all equipment via pack stock and crews

Description of the Alternative

What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?

Only non-motorized equipment and transport would be used to implement the project. All equipment and materials would be transported to the work site via livestock and work crews. Multiple trips into the backcountry with pack animals would be necessary, including several off-trail trips between the Akokala Lake Trail and the worksite. Only traditional hand tools would be used to construct the barrier; cross-cut saws would be used to fell trees for the barrier and prepare the logs. The project would require an anticipated ten to twelve weeks to complete over the course of two or three summer/fall work seasons. An estimated twelve workers would be required. The work crew would likely occupy all of the existing campsites at Akokala Lake Campground for much of the summer. Instead or additionally, given the large crew size, crews may need to establish an additional campsite at Akokala Lake. Work would likely need to begin in July, as soon as water levels dropped to safe levels, when visitor use is still high. During construction, attempts would be made to divert water around the work area. A non-inflatable water diversion barrier that could be packed to the project area on livestock may be used to divert as much water from the work site as possible; crews would nevertheless likely be working within stream flows during construction. Concrete, if needed for the barrier's construction, would be transported by livestock and mixed onsite by hand. Attempts would be made to anchor the barrier as securely as possible; anchoring limitations would compromise the structural integrity of the barrier. Anticipated long-term structural instability combined with a prolonged amount of time to construct the barrier and associated high costs would likely result in a decision not to build.

Mitigation: If work occurred, it would be underway during low stream flow periods (July-October). Logs would be collected well away from the trail, where evidence of their removal is not visible to hikers. Once the project is completed, brush, logs, and forest debris would be used to naturalize the immediate work site and the access route to the work site.

Component Activities

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

Component of the Action		Activity for this Alternative
X	*Example: Transportation of personnel to the project site*	*Example: Personnel will travel by horseback*
1	Transport personnel to and from the site.	Personnel would hike to and from the project area.
2	Transport equipment/supplies to and from	Equipment and supplies would be packed

	the site.	in with crews or livestock.
3	Build the barrier.	The barrier may or may not be constructed.
4	Durability of the barrier.	The barrier would not be durable for the long term.
5	Tools used to build the structure.	Hand tools only would be used to build the structure.

Wilderness Character

What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?

UNTRAMMELED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☐	☒
3	The barrier may or may not be constructed.	☐	☒	☐
4	The barrier would not be durable for the long term.	☐	☐	☒
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		0	1	NE
Untrammeled Total Rating		**-1**		

Explain:

Personnel hiking in and out of the project area and packing in equipment and supplies with livestock would not affect the untrammeled quality of recommended wilderness.

The barrier, even one that is constructed with hand tools, would block upstream fish passage, resulting in a manipulation of the community of life, and would therefore adversely affect the untrammeled quality of recommended wilderness in the Akokala drainage. The removal of trees for the barrier's construction and clearing brush for access to the work site would slightly and temporarily affect the untrammeled quality of the area.

The untrammeled quality would not be affected if the barrier is not constructed.

UNDEVELOPED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☐	☒

3	The barrier may or may not be constructed.	☐	☒	☒
4	The barrier would not be durable for the long term.	☐	☐	☒
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		0	1	NE
Undeveloped Total Rating		**-1**		

Explain:

Personnel hiking in and out of the project area would not affect the undeveloped quality of recommended wilderness. However, building the barrier by hand and transporting all equipment and materials by work crew and livestock would require an estimated twelve workers, and the work would need to occur during the high use visitor period for two to three seasons in order to complete the project. This could result in the establishment of additional temporary camping areas for the crews, which could temporarily degrade the undeveloped quality of recommended wilderness.

Construction of the barrier, even with hand tools, would result in the semi-permanent presence of a human-made structure, which would adversely affect the undeveloped quality of recommended wilderness in the area.

The undeveloped quality would not be affected if the barrier is not constructed.

NATURAL

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☒	☐
3	The barrier may or may not be constructed.	☒	☒	☐
4	The barrier would not be durable for the long term.	☐	☒	☐
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		1	3	NE
Natural Total Rating		**-2**		

Explain:

Work crews making multiple trips in and out of the project area over ten to twelve weeks for two to three summer/fall seasons would adversely impact soils and vegetation, especially between the Akokala Lake Trail and the work site; these resources would likely require some time to recover from the prolonged nature of the impacts, and recovery could require intervention from park staff. The prolonged duration of human activity could also disturb or displace wildlife. The removal of trees for the barrier's construction would also affect the natural quality of the area, but the effects would be slight and short term.

If the barrier is constructed, there would likely be some partial benefit to native fish populations in the Akokala drainage, and thus the natural condition of recommended

wilderness. However, a barrier constructed from hand tools alone would be structurally compromised because it could not be sufficiently anchored into the rock. If concrete is necessary, mixing it exclusively by hand and transporting it with livestock alone could limit the amount that could be used, possibly further diminishing the structure's long term durability and effectiveness. A structurally compromised barrier would not adequately protect native fish in Akokala Lake from invasion of non-native fish species, and could ultimately fail altogether. If the barrier is not structurally sound or is not constructed, native fish populations would likely be compromised or permanently lost as a result of non-native fish predation, competition, and hybridization. The ecological integrity and thus the natural condition of recommended wilderness in the upper Akokala Lake drainage could become permanently altered as non-native fish species predominate over native fish. A structurally compromised barrier would also likely require repeated visits to the site to make repairs to the structure, which would cause further trampling of vegetation and soils in the area and disturbances to wildlife.

The likelihood of structural instability from building the barrier by hand, combined with time constraints, infeasibility, and prolonged impacts to vegetation and wildlife from multiple seasons of trampling and human activity, could result in a decision not to build the barrier. Failure to build the barrier would negatively affect native fish populations, and thus the natural condition of recommended wilderness.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☒	☐
2	Equipment and supplies would be packed in with crews or livestock.	☐	☒	☐
3	The barrier may or may not be constructed.	☒	☒	☒
4	The barrier would not be durable for the long term.	☐	☒	☒
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		1	4	NE
Solitude or Primitive & Unconfined Rec. Total Rating		**-3**		

Explain:

Ongoing project activity, the presence of personnel for ten to twelve weeks over two to three summer/fall seasons, and crews and livestock making multiple trips on area trails would negatively affect opportunities for solitude both near the project area and along associated trails due to the prolonged nature of the activity. Most recreational opportunities would not be affected whether the barrier is constructed or not. Construction of the barrier could partially benefit recreational angling. But recreational angling would be negatively impacted if the barrier is not structurally sound, as would be anticipated from attempting to build it with hand tools, or if the barrier is not constructed. A failed barrier or no barrier at all could result in a reduced abundance of westslope cutthroat trout, the primary species caught by anglers in Akokala Lake. Anglers would also likely experience more difficulty in catching fish.

OTHER FEATURES OF VALUE

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☐	☒
3	The barrier may or may not be constructed.	☒	☒	☐
4	The barrier would not be durable for the long term.	☐	☒	☐
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		1	2	NE
Other Features of Value Total Rating		**-1**		

Explain:

The presence of personnel, livestock, equipment and supplies would not affect other features of value.

If the barrier is constructed, there could be some partial benefit to native fish populations and thus to the area's unique ecological, educational, and scientific values. However, a barrier constructed from hand tools alone could not be sufficiently anchored into the rock and would therefore be structurally compromised. The amount of concrete that could be used in the barrier's construction could be limited, possibly further diminishing the structure's long term durability and effectiveness. A structurally compromised barrier would not adequately protect native fish in Akokala Lake from invasion of non-native fish species, and could ultimately fail altogether. A failed barrier or a decision not to build the barrier would adversely affect unique scientific and educational values of the Akokala drainage because opportunities to study and monitor a fully functioning native aquatic species assemblage would be lost. The ecological integrity of the Akokala drainage would become permanently altered, also threatening the area's unique ecological value, including the long-term availability of important habitat refugia (i.e. free of invasive non-native species) for native fish species in the face of climate change.

Other Criteria

What is the effect of each component activity on other comparison criteria? What mitigation measures will be taken?

MAINTAINING TRADITIONAL SKILLS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☒	☐	☐
2	Equipment and supplies would be packed in with crews or livestock.	☒	☐	☐
3	The barrier may or may not be constructed.	☐	☐	☒

4	The barrier would not be durable for the long term.	☐	☐	☒
5	Hand tools only would be used to build the structure.	☒	☐	☐
Total Number of Effects		3	0	NE
Maintaining Traditional Skills Total Rating		**3**		

Explain:

Implementing the project exclusively with non-motorized means would provide opportunities to maintain proficiency in the use of traditional or primitive skills.

SPECIAL PROVISIONS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☐	☒
3	The barrier may or may not be constructed.	☐	☐	☒
4	The barrier would not be durable for the long term.	☐	☐	☒
5	Hand tools only would be used to build the structure.	☐	☐	☒
Total Number of Effects		0	0	NE
Special Provisions Total Rating		**0**		

Explain:

No special provisions are applicable.

ECONOMICS & TIME CONSTRAINTS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☒	☐
3	The barrier may or may not be constructed.	☐	☐	☒
4	The barrier would not be durable for the long term.	☐	☒	☐
5	Hand tools only would be used to build the structure.	☐	☒	☐
Total Number of Effects		0	3	NE
Economics & Time Constraints Total Rating		**-3**		

Explain:

Ten to twelve weeks over two to three summer/fall seasons would be required to construct the barrier exclusively with hand tools. An estimated crew of twelve workers would be required, which would incur a considerable monetary expense, especially given the time needed to build the barrier. Disturbances to vegetation and soils, wildlife, natural soundscapes, and visitor opportunities for solitude would be prolonged for two to three seasons. Cost and time constraints in addition to the likelihood of structural instability could result in a decision not to build the barrier.

If the barrier is built, the compromised structure would likely require repeated repairs, which would continue to incur costs over time. The barrier could also fail and allow non-native invasive lake trout to enter Akokala Lake, which could result in costly and time consuming gill netting operations to remove them.

Safety of Visitors & Workers
What is the effect of each component activity on the safety of visitors and workers? What mitigation measures will be taken?

SAFETY OF VISITORS & WORKERS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Equipment and supplies would be packed in with crews or livestock.	☐	☒	☐
3	The barrier may or may not be constructed.	☐	☐	☒
4	The barrier would not be durable for the long term.	☐	☐	☒
5	Hand tools only would be used to build the structure.	☐	☒	☐
Total Number of Effects		0	2	NE
Safety of Visitors & Workers Total Rating		**-2**		

Explain:

For some aspects of the project, hand tools could be less likely to cause injury than motorized tools. But this would be outweighed by a prolonged work period during which crews would be working and lifting heavy items in wet, cold conditions on slippery, uneven terrain. The prolonged work period (ten to twelve weeks over two to three seasons) would substantially increase the likelihood of a slip and fall injury. There would also be a prolonged risk of injury while felling trees due to the amount of time that would be required to fell the necessary trees with a crosscut saw. Loading heavy and/or bulky items onto pack stock could result in back injuries; the risk of back injuries would increase with prolonged work periods.

Summary Ratings for Alternative 2

Wilderness Character	
Untrammeled	-1
Undeveloped	-1
Natural	-2
Solitude or Primitive & Unconfined Recreation	-3
Other Features of Value	-1
Wilderness Character Summary Rating	**-8**

Other Criteria	
Maintaining Traditional Skills	3
Special Provisions	0
Economics & Time Constraints	-3
Other Criteria Summary Rating	**0**

Safety	
Safety of Visitors & Workers	-2
Safety Summary Rating	**-2**

MRDG STEP 2: Alternative 3

Alternative 3: Use some motorized equipment to construct the barrier; haul some materials via helicopter.

Description of the Alternative

What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken?

A combination of non-motorized and motorized means would be used to implement the project. Most of the equipment would be packed in on livestock. Particularly heavy or bulky equipment (such as a generator, possible electric concrete mixer, and water pumps) would be flown in on a long-line sling load via helicopter. Workers would hike to and from the work site and most likely camp at Akokala Lake Campground. An estimated six workers would be required. The project would require an estimated four to five weeks of work in late summer/fall the first year and possibly one to two weeks the following year. The use of helicopters would not be anticipated during the second year; any second year work would produce noise and activity similar to that caused by trail maintenance routinely underway in the park's backcountry. Additional camping areas would not need to be established.

Traditional hand tools would be used during the barrier's construction whenever possible. Additionally, chain saws would be used to fell trees for the barrier and an electric or gas drill would be used to drill holes into the rock to anchor and secure the structure. A non-inflatable water diversion barrier that could be packed to the project area on livestock may be used to divert as much water from the work site as possible. If necessary, water pumps would be used to help divert creek water around the work area. If concrete is used, it would be mixed onsite by hand if possible, but a small electric concrete mixer may be needed depending on the necessary quantity of concrete. A small gas-powered portable generator would be used to power the drill, water pumps, and possibly the concrete mixer. Other motorized hand tools may be used as necessary.

Mitigations: Non-electric tools would be used as much as possible to reduce artificial noise. Administrative helicopter flights would be coordinated with other projects in the area and hauling needs would be combined as possible to minimize administrative flights over recommended wilderness. Construction debris, equipment, and garbage that could not be packed out would be flown out on back-hauls of incoming flights. The staging area for helicopter flights would be located outside the North Fork's Wild and Scenic River Corridor. Work would be conducted during the late summer/fall, after the peak visitation period, to minimize the number of visitors impacted by the project. Logs would be collected well away from the trail, where evidence of their removal is not visible to hikers. Once the project is completed, brush, logs, and forest debris would be used to naturalize the immediate work site and the trail to the work site.

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

Component of the Action		Activity for this Alternative
X	*Example: Transportation of personnel to the project site*	*Example: Personnel will travel by horseback*
1	Transport personnel to and from the site.	Personnel would hike to and from the project area.
2	Transport equipment/supplies to and from the site.	Most supplies would be packed via livestock; some items would be transported by helicopter.
3	Build the barrier.	The barrier would be built.
4	Durability of the barrier.	The barrier would be durable for the long term.
5	Tools used to build the structure.	Both motorized and non-motorized tools would be used to construct the barrier.

Wilderness Character
What is the effect of each component activity on the qualities of wilderness character? What mitigation measures will be taken?

UNTRAMMELED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☐	☐	☒
3	The barrier would be built.	☐	☒	☐
4	The barrier would be durable for the long term.	☐	☒	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☐	☐	☒
Total Number of Effects		0	2	NE
Untrammeled Total Rating		**-2**		

Explain:

Personnel hiking in and out of the project area, the transport of equipment and supplies, and the use of tools are not manipulations of the community of life and therefore would not affect the untrammeled quality of recommended wilderness.

The barrier would block upstream fish passage, resulting in a manipulation of the community

of life, and would therefore adversely affect the untrammeled quality of recommended wilderness. The removal of trees for the barrier's construction and clearing brush for access to the work site would slightly and temporarily affect the untrammeled quality of the area.

UNDEVELOPED

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☐	☒	☐
3	The barrier would be built.	☐	☒	☐
4	The barrier would be durable for the long term.	☐	☒	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☐	☒	☐
Total Number of Effects		0	4	NE
Undeveloped Total Rating		**-4**		

Explain:

Personnel hiking in and out of the project area and the use of livestock would not affect the undeveloped quality of recommended wilderness.

Transporting some equipment via helicopter and the use of some motorized tools to construct the barrier would temporarily degrade the undeveloped quality of recommended wilderness.

Construction of the barrier would result in the semi-permanent presence of a human-made structure, which would adversely affect the undeveloped quality of recommended wilderness at the barrier site.

NATURAL

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☒	☐	☒
3	The barrier would be built.	☒	☐	☐
4	The barrier would be durable for the long term.	☒	☐	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☒	☐	☐
Total Number of Effects		4	0	NE
Natural Total Rating		**4**		

Explain:

Using some motorized tools and transporting some equipment via helicopter would enable the construction of a structurally sound barrier. A structurally sound, durable barrier would be effective against the invasion of non-native fish species for the long term. This would appreciably benefit the natural condition and the ecological integrity of recommended wilderness within the upper Akokala Lake drainage.

Work crews travelling in and out of the project area for one or two work seasons would have some adverse impact to soils and vegetation between the Akokala Lake Trail and the work site. These impacts would be temporary and slight, however, given the relatively short duration over which they would occur (four to five weeks anticipated for the first year; possibly one to two weeks the second year). The removal of trees for the barrier's construction and clearing brush for access to the work site would slightly affect the natural quality of the area for the short term. As stated in the EA for the project, impacts to vegetation and soils would be negligible to minor and would recover in a short period of time, and affected vegetation would likely recover completely without intervention from park staff.

SOLITUDE OR PRIMITIVE & UNCONFINED RECREATION

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☐	☒	☐
3	The barrier would be built.	☒	☐	☐
4	The barrier would be durable for the long term.	☒	☐	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☐	☒	☐
Total Number of Effects		2	2	NE
Solitude or Primitive & Unconfined Rec. Total Rating		**0**		

Explain:

The use of motorized equipment would disrupt opportunities for solitude. Such disruptions would be of relatively short duration, occurring intermittently for approximately four to five weeks the first year and possibly one to two weeks the second year. It is anticipated that work during the second year would be accomplished without the use of helicopters and motorized equipment other than what is typically used by park trail crews during trail maintenance. The use of some motorized equipment and transport would enable a relatively short project duration, thereby limiting the length of time over which opportunities for solitude would be disrupted.

The barrier itself would not disrupt opportunities for solitude or recreation. But the barrier would protect native fish and thereby maintain recreational angling opportunities at Akokala Lake.

OTHER FEATURES OF VALUE

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☒	☐	☐
3	The barrier would be built.	☒	☐	☐
4	The barrier would be durable for the long term.	☒	☐	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☒	☐	☐
Total Number of Effects		4	0	NE
Other Features of Value Total Rating		**4**		

Explain:

Personnel hiking to and from the project area would not affect other features of value.

Using some motorized tools and transporting some equipment via helicopter would enable the construction of a structurally sound barrier that would be effective against the invasion of non-native fish species for the long term. The ecological integrity of the Akokala drainage would be safeguarded, thus protecting the area's unique ecological value, including the long-term availability of important habitat refugia (i.e. free of invasive non-native species) for native fish species in the face of climate change.. The unique scientific and educational value of the Akokala drainage would be preserved, as opportunities to study and monitor a fully functioning native aquatic species assemblage would be protected.

Other Criteria

What is the effect of each component activity on other comparison criteria? What mitigation measures will be taken?

MAINTAINING TRADITIONAL SKILLS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☒	☐	☐
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☒	☒	☐
3	The barrier would be built.	☐	☐	☒
4	The barrier would be durable for the long term.	☐	☐	☒
5	Both motorized and non-motorized tools would be used to construct the barrier.	☒	☒	☐
Total Number of Effects		3	2	NE

Maintaining Traditional Skills Total Rating	**1**

Explain:

This alternative would both positively and negatively affect opportunities to employ traditional skills. The use of a helicopter and some motorized tools would decrease such opportunities, but horse packing some equipment and the use of traditional non-motorized equipment whenever possible would maintain some proficiency in the use of traditional or primitive skills.

SPECIAL PROVISIONS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☐	☐	☒
3	The barrier would be built.	☐	☐	☒
4	The barrier would be durable for the long term.	☐	☐	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☐	☐	☐
Total Number of Effects		0	0	NE
Special Provisions Total Rating		**0**		

Explain:

There are no applicable special provisions.

ECONOMICS & TIME CONSTRAINTS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☒	☐	☐
3	The barrier would be built.	☐	☐	☒
4	The barrier would be durable for the long term.	☒	☐	☐
5	Both motorized and non-motorized tools would be used to construct the barrier.	☒	☐	☐
Total Number of Effects		3	0	NE
Economics & Time Constraints Total Rating		**3**		

Explain:

The use of some motorized tools and equipment transport would enable the construction of

the barrier to occur over a relatively short period of time (likely during four to five weeks the first year and possibly one to two weeks the second year) with an estimated six-person crew, which would improve cost efficiency. Keeping the work period as short as possible would also limit the duration of human activity and associated impacts to resources such as vegetation, soils, and wildlife, as well as visitor opportunities for solitude. This alternative would also result in a durable structure, making the project a cost-effective endeavor for the long-term.

Safety of Visitors & Workers
What is the effect of each component activity on the safety of visitors and workers? What mitigation measures will be taken?

SAFETY OF VISITORS & WORKERS

Component Activity for this Alternative		Positive	Negative	No Effect
X	*Example: Personnel will travel by horseback*	☐	☐	☒
1	Personnel would hike to and from the project area.	☐	☐	☒
2	Most supplies would be packed via livestock; some items would be transported by helicopter.	☒	☒	☐
3	The barrier would be built.	☐	☐	☒
4	The barrier would be durable for the long term.	☐	☐	☒
5	Both motorized and non-motorized tools would be used to construct the barrier.	☒	☒	☐
Total Number of Effects		2	2	NE
Safety of Visitors & Workers Total Rating		**0**		

Explain:

There would be advantages and disadvantages in terms of safety under this alternative. There would be some risk of injury from using motorized tools and during helicopter operations. But motorized tools and transport would reduce the duration of the work period and hence the amount of time crews would be subjected to potentially hazardous working conditions (i.e. lifting heavy items on slippery, uneven terrain in wet, cold conditions in the backcountry). Less time in such conditions would reduce the potential for slips/falls and back injuries.

Summary Ratings for Alternative 3

Wilderness Character	
Untrammeled	-2
Undeveloped	-4
Natural	4
Solitude or Primitive & Unconfined Recreation	0
Other Features of Value	4
Wilderness Character Summary Rating	**2**

Other Criteria	
Maintaining Traditional Skills	1
Special Provisions	0
Economics & Time Constraints	3
Other Criteria Summary Rating	**4**

Safety	
Safety of Visitors & Workers	0
Safety Summary Rating	**0**

MRDG STEP 2: Alternative Comparison

Alternative 1:	No Action
Alternative 2:	Construct the fish passage barrier using only hand tools, transport all equipment via pack stock and crews
Alternative 3:	Use some motorized equipment to construct the barrier; haul some materials via helicopter.

Wilderness Character	Alt 1		Alt 2		Alt 3	
	+	-	+	-	+	-
Untrammeled	0	0	0	1	0	2
Undeveloped	0	1	0	1	0	4
Natural	0	1	1	3	4	0
Solitude or Primitive & Unconfined Rec.	0	1	1	4	2	2
Other Features of Value	0	1	1	2	4	0
Total Number of Effects	0	4	3	11	10	8
Wilderness Character Rating	-4		-8		2	
Other Criteria	Alt 1		Alt 2		Alt 3	
	+	-	+	-	+	-
Maintaining Traditional Skills	0	0	3	0	3	2
Special Provisions	0	0	0	0	0	0
Economics & Time Constraints	0	1	0	3	3	0
Total Number of Effects	0	1	3	3	6	2
Other Criteria Rating	**-1**		**0**		**4**	
Safety	Alt 1		Alt 2		Alt 3	
	+	-	+	-	+	-
Safety of Visitors & Workers	0	0	0	2	2	2
Safety Rating	**0**		**-2**		**0**	

MRDG STEP 2: Alternatives Not Analyzed

Alternatives Not Analyzed
What alternatives were considered by not analyzed? Why were they not analyzed?

Construct the barrier at or immediately upstream or downstream of the Akokala Creek Bridge along the Inside North Fork Road. The Akokala Creek fish passage barrier was originally conceived as a structure that could be installed at or near the Akokala Creek Bridge, where it would be outside of recommended wilderness and where it would protect the greatest amount of habitat. Under this original proposal, the park considered either one or more concrete box culverts at the bridge, or a two-step low water crossing just downstream of the bridge. During the design phase, however, topographic surveys and hydraulic modeling data indicated that the effectiveness of a barrier at the bridge would be severely hindered by the topography of the area, the broad floodplain in the vicinity of the bridge, and the low gradient of the stream. Construction would also require major channel modification downstream of the bridge site, which would encroach on the Wild and Scenic River Corridor. Also, with preliminary estimates between $500,000-$700,000, the cost of constructing the barrier at the bridge would be prohibitive, especially if the finished product would only be partially effective at best.

In addition, migratory cutthroat trout from Flathead Lake use lower Akokala Creek for spawning and placing the barrier at the bridge would substantially reduce the amount of habitat available for their use. Hybridization between westslope cutthroat trout and rainbow trout has also been documented upstream of the bridge, further compromising the effectiveness of a barrier at this location. A migratory westslope-rainbow trout hybrid was previously documented entering Akokala Creek and likely spawned in lower Akokala Creek. Hybridization is likely a recent development and the upper portions of the drainage do not appear to be impacted. A genetic survey in Akokala Creek conducted in 2008 did not indicate any evidence of hybridization near the Bowman Lake Trail crossing, which is the general location of the barrier under the current proposal. For these reasons, plans to construct a barrier at the bridge were not further developed, and the alternative was dismissed. A barrier upstream or downstream of the Akokala Creek Bridge was considered but dismissed because the stream gradient and topography in the area are too low (similar to that of the bridge location).

MRDG STEP 2: Decision

Refer to the **MRDG Instructions** before identifying the selected alternative and explaining the rationale for the selection.

Selected Alternative		
☐	Alternative 1:	No Action
☐	Alternative 2:	Construct the fish passage barrier using only hand tools, transport all equipment via pack stock and crews.
☒	Alternative 3:	Use some motorized equipment to construct the barrier; haul some materials via helicopter.

Explain Rationale for Selection:

Alternative 3 is selected because it would 1) enable the construction of a structurally sound, durable barrier and therefore most effectively protect native fish in the Akokala drainage from non-native invasive species for the long term; 2) limit the amount of time necessary to construct the barrier, thereby limiting the extent and duration of adverse impacts to natural resources and the duration of adverse impacts to the visitor backcountry experience; 3) be the most economically feasible alternative; 4) minimize safety risks to work crews by limiting the project duration and the amount of time crews would be working in potentially hazardous conditions.

It would not be possible to construct an effective and durable fish passage barrier using only hand tools as described under Alternative 2. Attempting to do so would only prolong the project, impacting natural resources and visitors over a longer period of time. We would also not be able to employ some potentially critical pieces of equipment such as water pumps to assist with water diversion. If concrete is necessary for the barrier's construction, the absence of a concrete mixer could limit the amount that could be used. A structurally unsound barrier could result in the need for costly, time consuming, and potentially disruptive motorized gill netting and lake trout removal operations over the long term if lake trout enter Akokala Lake. Alternative 2 would also increase the amount of time over which workers are exposed to potentially hazardous conditions such as working in cold, wet conditions on slippery, uneven stream bottoms. Alternative 2 would not be nearly as economically feasible as Alternative 3, and could result in cancellation of the project.

No action would have the least overall impact on wilderness character. But it would also constitute failure to undertake a feasible opportunity to protect native fish species in the park, and would therefore be non-conformant with a number of NPS management policies, as well as the Endangered Species Act and the 1916 Organic Act, which directs the NPS to conserve and manage native populations of plants and animals within the park in an unimpaired state for the enjoyment of future generations. The NPS is not only responsible for managing for wilderness character, but also for the preservation of native species. Section 4(a) of the Wilderness Act states the following: "The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and wildlife refuge systems are established and administered". In specific reference to wilderness within the national park system, Section 4 (a) (3) of the Act holds that a wilderness designation of lands within a national park "shall in no manner lower the standards evolved for the use and preservation of such park". No action would likely allow non-native invasive lake trout to enter Akokala Lake, which could result in time consuming, costly, and potentially disruptive motorized gill netting and lake trout removal operations for the long term. Alternative 3 has therefore been selected because it best meets the park's overall resource

management obligations and responsibilities.

Describe Monitoring & Reporting Requirements:

Project success will be regularly measured through standardized netting surveys and bull trout redd counts. Annual reporting to the USFWS will occur in accordance with Section 10 of the Endangered Species Act.

Approval of Prohibited Uses:

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

☒	Mechanical Transport:	an anticipated 3 helicopter flights may be necessary
☒	Motorized Equipment:	chainsaw, drills, water pumps, other hand tools
☐	Motor Vehicles:	
☐	Motorboats:	
☒	Landing of Aircraft:	equipment would likely be delivered via long line
☐	Temporary Roads:	
☒	Structures:	fish passage barrier
☐	Installations:	

Record and report any authorizations of Wilderness Act Section 4(c) prohibited uses according to agency policies or guidance. Refer to agency policies for the following review and decision authorities:

Prepared:

Signature Date

Recommended:

Signature Date

Recommended:

Signature Date

Approved:

Signature Date