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

Rose Creek Fish Barrier Removal and Bridge Replacement

Environmental Assessment
& Statement of Findings - Floodplains

December 2011

Weir on Rose Creek - NPS photo.

Rose Creek Bridge - NPS photo.

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Environmental Assessment

Rose Creek Fish Barrier Removal and Bridge Replacement

Glacier National Park • Montana

SUMMARY

The long-term persistence of native fish populations within Glacier National Park depends in part on the ability of fish to migrate upstream to spawning and rearing habitat. Fish passage on lower Rose Creek has been blocked for decades by an abandoned weir (a small dam or water intake structure that allows a shallow overflow of water) just above the Rising Sun developed area and campground. Additionally, the long-term structural stability of the Rose Creek Bridge on the Going-to-the-Sun Road (GTSR) is threatened by sediment scouring on the downstream side of a concrete slab spanning the width of the stream beneath the bridge. The bridge's abutments are showing signs of settling, its span is too narrow to accommodate natural shifts in the stream channel over time, and maintenance will increase as the concrete ages. The concrete slab also inhibits fish passage during periods of low stream flow, and the bridge's appearance is not compatible with the historic design characteristics of the GTSR, a notable National Historic Landmark.Glacier National Park is proposing to 1) remove the abandoned weir and restore access to historic spawning and rearing habitat for native fish, and 2) replace the Rose Creek Bridge with a clear span bridge.

This Environmental Assessment (EA) evaluates two alternatives, including a no action alternative. Under Alternative A (no action), the weir would not be removed and the Rose Creek Bridge would not be replaced. Under Alternative B, the action alternative, the weir would be removed and the Rose Creek Bridge would be replaced. Attempts would be made to remove the weir across the entire width of the stream. The concrete forming the weir would be removed until it is level with the streambed or no longer presents a barrier to fish passage, and protruding segments of abandoned metal water pipe would be cut level with the streambed. This project would be funded by the U.S. Fish and Wildlife Service. The Rose Creek Bridge would be replaced with a new, approximately 85 foot-long, concrete girder, clear span bridge (no footings, pilings, or piers in the stream channel). The existing bridge would be demolished and all concrete and reinforcing steel would be removed and disposed of outside the park. Riprap would likely be required to armor and protect the new abutments. A cast-in-place concrete deck would be poured, the railing and wing walls would be faced with ashlar or rubble stone, and the appearance of the new bridge would be more compatible with the historic characteristics of the Going-to-the-Sun Road. The replacement of the Rose Creek Bridge would be funded by the Federal Lands Highway Program as part of the GTSR Rehabilitation Project. Replacement of this bridge was not analyzed in the 2003 FEIS.

This environmental assessment 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/aquatic threatened species and species of concern, water resources, floodplains, vegetation, soils, and historic structures and cultural landscapes. Public scoping was conducted in accordance with the National Environmental Policy Act (NEPA), and the comments received were largely in support of the proposed project.

The no action alternative would have long-term, local adverse impacts to bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), and burbot (*Lota lota*)

from limited availability of historic spawning and rearing habitat; adverse impacts to bull trout would be minor, and adverse impacts to westslope cutthroat trout and burbot would be negligible to minor. No action would have long-term, site-specific, negligible to minor adverse impacts to water resources due to unabated sediment scouring and stream channel degradation, and negligible to minor, adverse, site-specific, and long-term impacts to floodplains from ongoing obstructions to flood flows at the Rose Creek Bridge. Negligible to minor adverse, long-term, and site-specific impacts to soils would continue from ongoing sediment aggradation, channel widening, and erosion of the stream banks. There would be no impacts to vegetation or historic structures and cultural landscapes.

The action alternative would have negligible to minor adverse, site-specific, and short term impacts to bull trout, westslope cutthroat trout, and burbot due to temporary turbidity and habitat disturbances during project implementation. The project would increase the amount of available stream habitat and have long-term beneficial, local impacts to fisheries; beneficial impacts to bull trout would be moderate, beneficial impacts to westslope cutthroat trout would be minor, and beneficial impacts to burbot would be negligible to minor. Under Section 7 of the Endangered Species Act, the preferred alternative may affect, but is not likely to adversely affect bull trout. There would be minor to moderate adverse, site-specific, and short-term impacts to water resources from a temporary release of upstream sediments from removing the weir, some use of heavy equipment in the stream channel, and recontouring of the stream bed underneath the bridge. Improved sediment transport would have minor, site-specific, beneficial impacts to water resources for the long-term. Removing features that restrict flood flows would have negligible to minor, site-specific, and long-term beneficial impacts to floodplains; the abutments for the new bridge would occupy the floodplain and displace some water during flood flows, causing negligible adverse, site-specific, and long-term impacts to floodplains, and there would be negligible adverse, site-specific, and short-term impacts to floodplains from disturbances during project implementation. Impacts to vegetation and soils would be minor, adverse, site-specific, and short-term from disturbance, compaction, and the loss of some individual plants; minor beneficial, site-specific, and long-term impacts to soils would occur from improved sediment transport and reduced stream bank soil erosion. The proposed plan would have minor beneficial, long-term, site-specific and local impacts to historic structures and cultural landscapes because the appearance of the new bridge would be more compatible with the historic design characteristics of the Going-to-the-Sun Road.

How to Comment

Comments on this environmental assessment can be provided directly through the park's planning website at http://parkplanning.nps.gov/RoseCreek. Or write to: Superintendent, Glacier National Park, Attention: *Rose Creek 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.

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PURPOSE and NEED

Introduction

Glacier National Park is located in northwestern Montana along the Canadian border. The park is in the northern Rockies, and straddles the rugged mountains of the Continental Divide. Together with Canada's Waterton Lakes National Park, it forms 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.

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.

Native fish are integral to Glacier National Park's ecological diversity and natural heritage. The distribution and long-term persistence of native fish populations depends in part on the ability of fish to migrate upstream and reach spawning and rearing habitat within the park's waterways. An abandoned weir (a small dam or water intake structure that allows a shallow overflow of water) on lower Rose Creek just above the Rising Sun developed area completely blocks fish passage.

In addition, the structural stability of the Rose Creek Bridge on the Going-to-the-Sun Road (GTSR) is threatened by sediment scouring on the downstream side of a concrete slab spanning the width of the stream beneath the bridge. The slab also inhibits fish passage during periods of low stream flow, and the bridge's appearance is not compatible with the historic design characteristics of the GTSR, a notable National Historic Landmark.

The proposed project would remove the weir and replace the Rose Creek Bridge with a clear span bridge. Both actions would result in restoring access to historic spawning and rearing

habitat for native fish and improve stream flow and sediment transport. Additionally, the new bridge would be more compatible with the historic design characteristics of the GTSR.

This environmental assessment 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 Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

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

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

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

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to pursue or restore the integrity of park resources or values and it cannot be further mitigated. A non-impairment determination will be prepared for the selected action and appended to the decision document.

Background

Native fisheries on both sides of the Continental Divide in Glacier National Park have become severely compromised, primarily due to the invasion and establishment of non-native fish species (Marnell 1988, Fredenberg 2002). The ability of native fish to migrate and maximize their distribution within the park's waterways is therefore critical to the long-term survival and productivity of native fish populations. In the St. Mary River drainage east of the Continental Divide, distribution of native fish is limited by natural cascades and waterfalls that inhibit fish passage and access to spawning and rearing habitat. Only a few large tributaries provide access for migratory bull trout. Culverts, bridges, and water diversion structures that present additional barriers to fish movement are therefore of concern.

In 1956, a weir was constructed on Rose Creek to provide water to the Rising Sun development and campground. A weir is a small dam or water intake structure that allows a shallow overflow of water (Figure 1). After the weir was damaged in a 1964 flood, it was replaced with a new,

similar intake structure farther downstream, just above the Rising Sun developed area (Figure 2). The new weir was abandoned in 1971, when the NPS drilled a well to provide water to Rising Sun. The now abandoned weir spans the width of the stream, is approximately 5 foot high, and blocks native fish, including bull trout, from migrating from St. Mary Lake to historic upstream spawning and rearing habitat. An impassable falls approximately 0.57 mile (918 meters) upstream of the weir and a smaller high-gradient cascade between the falls and the weir present additional, but natural barriers to upstream fish migration. Fish may be able to pass through the smaller high gradient cascade during high flows. The original 1956 intake structure does not obstruct fish passage due to a breach on one side that allows upstream fish movement.

Figure 1: The weir on lower Rose Creek – NPS photo.

At the time of the weir's construction, the NPS may have believed that fish could not ascend a bedrock outcrop located approximately ten meters downstream. But recent sampling by the USFWS (J. Mogen, personal communication) revealed that fish can ascend the outcrop to the base of the weir. Cutthroat trout have been captured upstream of the bedrock outcrop, and burbot and bull trout have been captured further downstream, but there are no fish present immediately upstream of the weir. However, Otokomi Lake, located in the headwaters of Rose Creek, supports a population of Yellowstone cutthroat trout. These fish can and likely do periodically migrate downstream through the project area, but upstream fish passage from lower Rose Creek is not possible due to the weir and natural waterfalls.

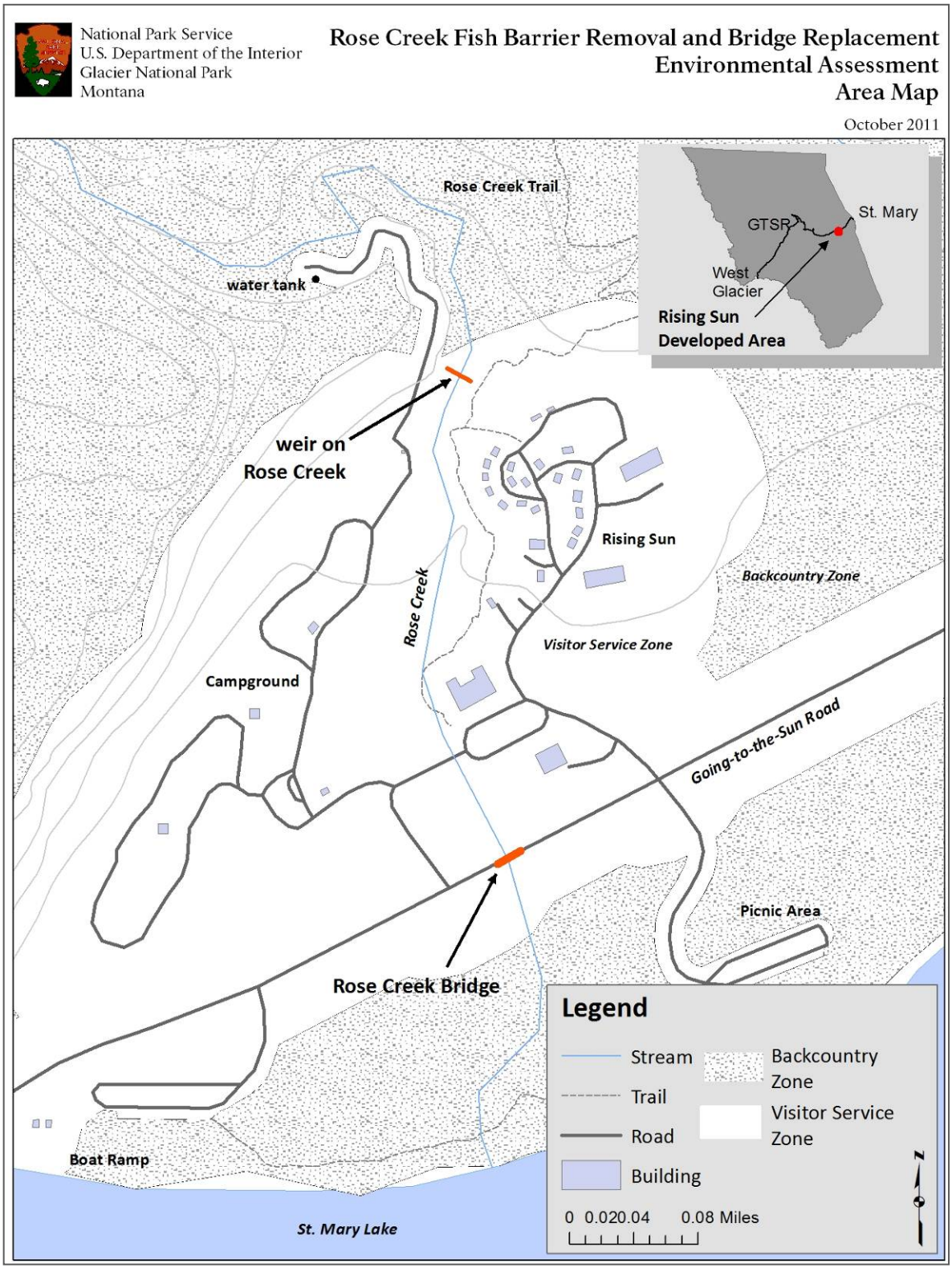

Figure 2: Location of the Rose Creek Bridge and the post 1964 weir on lower Rose Creek.

Removing the weir on Rose Creek would maximize the amount of available fish habitat in the drainage, allowing native fish access to over one-half mile of additional high-quality habitat, more than doubling the amount that is currently available (Figure 3). In 2009, the USFWS secured funding to remove the structure, and the NPS entered into an Interagency Agreement with the USFWS to assess the feasibility of removing the weir. Rose Creek is not Critical Habitat for bull trout (USFWS 2010).

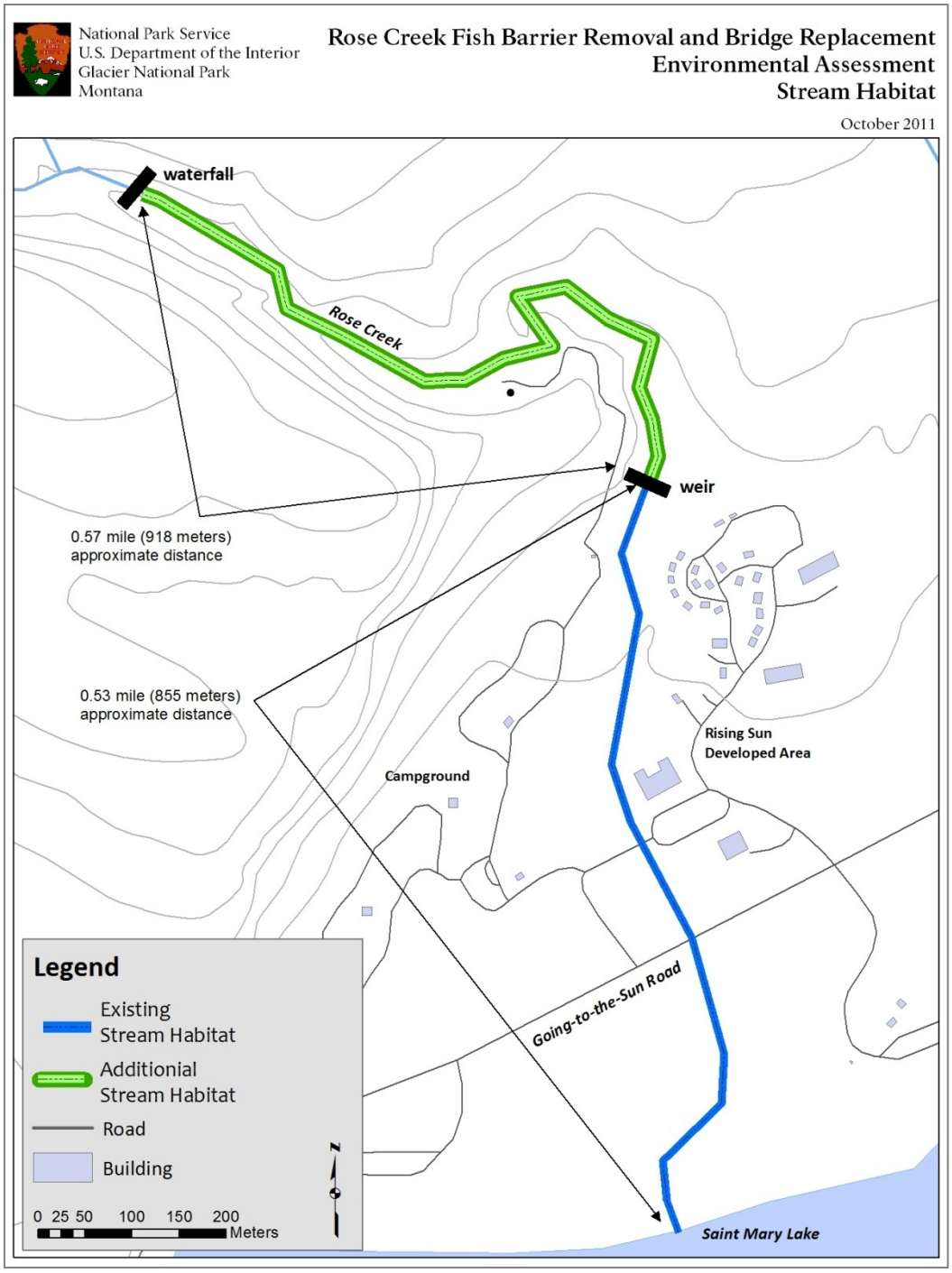

Figure 3: Map illustrating existing stream habitat along lower Rose Creek and additional habitat that would become available with the removal of the weir.

Additionally, sediment scouring and degradation of the stream channel are undermining the long-term structural stability of the Rose Creek Bridge on the GTSR (Figure 4). The bridge's piers are connected by a solid concrete sill that spans the width of the stream. Water passes over the sill in a sheet flow, resulting in the removal of sediments, or scouring, on the downstream side. The mid-channel piers have altered sediment transport through the reach and caused channel aggradation, or a buildup of sediments, upstream of the bridge. The bridge's abutments are also showing signs of settling, maintenance will increase as the concrete ages, and the bridge's span is too narrow to accommodate natural shifting of the stream channel over time. The concrete sill also presents a second manmade barrier to fish passage. During periods of low stream flow in the summer and fall, the drop created by sediment scouring on the downstream side of the sill is approximately 2-3 feet high and likely prevents fish from migrating upstream.

Finally, the appearance of the bridge is not compatible with the historic design characteristics of original structures and other features along the GTSR, a notable National Historic Landmark. The original 1932 bridge was severely damaged by a flood in 1964. When it was rebuilt the same year, the original rubble stone wing walls and railing were replaced with concrete and steel tube railing. This blend of contemporary materials with earlier features does not clearly represent historic design principles of either era, and the bridge is the only large structure along the GTSR that is not in keeping with the road's historic design characteristics.

Figure 4: Rose Creek Bridge - NPS photo.

Of note, Rose Creek was known historically as Roes Creek, possibly due to an early typographical error or misspelling of the surname of Charles Rose, whose Blackfeet name was Otah-komi and who was the son of an American Fur employee and his Cree or Piegan wife. The "Roes" spelling once referred to the entire Rose Creek drainage, and was used on park maps from 1911 until 1968, when the U.S. Geographical Survey (USGS) corrected the spelling to "Rose". In 1970, the Board of Geographic Names officially corrected the spelling to "Rose", and the NPS concurred with the Board's decision. The National Register of Historic Places and preliminary designs for the new bridge use the historic "Roes" when referring to the bridge. For the purposes of this EA, the bridge and the drainage will be referred to with the "Rose" spelling.

As part of the environmental assessment process, the park prepared Determinations of Eligibility for the National Register of Historic Places for the Rose Creek Bridge and the Rose Creek water intake structure. The Montana State Historic Preservation Office concurred with the park's determination that neither structure meets the criteria for listing.

Purpose and Need

The upstream migration of native fish is impeded by the weir on Rose Creek and the Rose Creek Bridge. Additionally, the bridge has structural concerns and is not compatible with the historic design characteristics of the GTSR, a National Historic Landmark. The purpose of the project is to restore fish passage and provide a structurally sound bridge that is in keeping with the GTSR's historic design characteristics. The following objectives would be met by this project:

- Restore fish passage on Rose Creek to provide access to historic spawning and rearing habitat for native fish.
- Improve sediment transport along lower Rose Creek.
- Address the structural concerns and incompatible historic design elements of the Rose Creek Bridge.

Relationship to Other Plans and Policies

Current plans and policies that pertain to this proposal include the *Glacier National Park General Management Plan* (GMP) (NPS 1999), which provides overall guidance and direction for the park, including backcountry areas, and the *Going-to-the-Sun Road Rehabilitation Plan/Final Environmental Impact Statement* (NPS 2003), which analyzed impacts and determined how to rehabilitate the GTSR.

Scoping and Public Involvement

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 June 24, 2011, and the comment period closed on July 29, 2011. 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.

Glacier National Park notified the U.S. Fish and Wildlife Service (USFWS) of the proposed project and initiated informal consultation in accordance with Section 7 of the Endangered Species Act, and the Montana State Historic Preservation Office (SHPO), the Confederated Salish and Kootenai Tribes, and the Blackfeet Tribal Business Council as required by 36 CFR800. On July 19, 2011, park staff met with a representative from the Army Corps of Engineers (COE) onsite to discuss the proposed project.

Six letters were received during scoping, all from private individuals. All six letters were supportive of the proposal to remove the weir and all but one were in full support of replacing the bridge, with one commenter expressing partial opposition to a completely new bridge. Suggestions included conducting long-term monitoring following the project to determine whether removing the barriers was beneficial for fish and sediment transport; removing one barrier then waiting several years before removing the second barrier to reduce impacts to the stream channel and so that the effects to the fish community can be monitored and determined; imprinting the year of the bridge's construction into the concrete where it would be visible to drivers; and constructing the new bridge from peeled logs and timbers. An alternative to replacing the bridge was suggested, and entailed fixing the stream channel, repairing the bridge, and retrofitting the bridge with stone facing and appropriate railings instead of replacing it.

Concerns raised during scoping included the possibility for non-native fish and other invasive species to access the Rose Creek drainage once the barriers are removed; increased turbidity within the stream; effects to the fish community and the stream channel from removing two barriers at the same time; the cost of materials; and whether a new water source has replaced that provided by the intake structure.

These ideas, concerns and suggested alternatives are addressed under *Alternatives, Suggestions, and Concerns Considered but Eliminated from Detailed Study,* and *Affected Environment and Environmental Consequences* sections of this EA.

A letter dated August 4, 2011, from the Army Corps of Engineers stated that the project may qualify for a Nationwide Permit 27.

A fisheries biological assessment has been prepared and submitted to the USFWS for their review and concurrence along with a copy of this EA.

The Montana State Historic Preservation Office has concurred with the park's determination that neither the weir on Rose Creek nor the Rose Creek Bridge meets the criteria for listing in the National Register of Historic Places.

Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders; 2006 NPS *Management Policies*; findings from the Montana State Historic Preservation Officer; and NPS knowledge of natural and cultural resources within the Rose Creek drainage. Issues and concerns affecting the proposed action were identified by the public, other federal and state agencies, and the National Park Service. Impact topics are identified by determining what resources could be affected by the alternatives. Impact topics that are carried forward for further analysis in this environmental assessment are listed below along with the reasons why the impact topic is further analyzed.

The NPS defines "measurable" impacts as moderate or greater effects, and 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 environmental impact statement (EIS). Dismissing impact topics from further evaluation that are determined to have minor or less impacts insures that the EA or EIS to concentrates 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).

Fisheries

According to the 2006 *Management Policies*, the NPS maintains all animals native to the natural ecosystems of parks, including fish. Habitat restoration is one means by which the NPS maintains native fish species. Native fisheries would benefit from the restoration of habitat as a result of the proposed project; this topic is therefore retained for analysis.

Threatened, Endangered, and Candidate Species and Species of Concern

The NPS protects and attempts to recover all native species that are listed under the Endangered Species Act of 1973. Both the *Management Policies* (2006) and Director's Order 77 *Natural Resources Management Guidelines* require the NPS to examine and minimize the impacts of projects on federal candidate species as well as federally listed threatened, endangered, and state listed rare, declining, and sensitive species. Additionally, Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service (USFWS) on federally listed species.

Federally Listed Species

Bull Trout (*Salvelinus confluentus*). Bull trout are listed as threatened under the Endangered Species Act and are also a state listed Species of Concern. Rose Creek is not Critical Habitat for bull trout, but one juvenile and one sub-adult-sized bull trout have been captured in previous sampling conducted downstream of the weir (J. Mogen, USFWS, personal communication). Use of Rose Creek by bull trout appears transient and the drainage does not appear to support a reproducing population at this time. Temporary habitat disturbances from the proposed project could impact an individual bull trout for the short term, but a resultant increase in the availability of historic habitat may benefit bull trout over the long term. Bull trout are therefore retained as an analysis topic.

Species of Concern

Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*). Westslope cutthroat trout are listed by the state of Montana as a Species of Concern. Cutthroat trout have been observed spawning in Rose Creek downstream of the weir, and individuals captured downstream are morphologically similar to westslope cutthroat trout. Otokomi Lake, located in the headwaters of the Rose Creek drainage, supports a population of introduced Yellowstone cutthroat trout (Marnell et al. 1987). It is likely that below the weir, Rose Creek supports a reproducing population of hybridized westslope and Yellowstone cutthroat trout. Habitat disturbances during implementation of the proposed actions could have temporary impacts to westslope cutthroat trout, but increased availability of historic stream habitat would likely benefit the species. This topic is therefore analyzed.

Water Resources

The Clean Water Act was enacted 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 consistent with the Clean Water Act. The US Environmental Protection Agency (EPA) also has responsibility for oversight and review of permits and actions which affect waters of the United States. Because water resources would be affected by the proposed project, the topic is retained for analysis. NPS policies require protection of water quality in accordance with the Clean Water Act.

Floodplains

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. Because there would be some beneficial and adverse impacts to floodplains from the bridge replacement, the topic is retained for analysis. A *Statement of Findings for Floodplains* is also included as required by NPS guidelines for complying with Executive Order 11988.

Vegetation

The NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants (NPS 2006). Most of lower Rose Creek is an unvegetated waterway with some overstory vegetation at the outer edges of the high water mark and understory vegetation at the edges of the creek. The proposed actions would affect vegetation within the project area, and this topic is retained for analysis.

Soils

The NPS preserves the soil resources of parks and protects those resources by preventing unnatural erosion, physical removal, or contamination (NPS 2006). The soils along Rose Creek through the Rising Sun Developed area are classified as clay-rich conifer and clay-rich aspen forest soils for the upper reaches of the creek, and as alluvial grassland soils found on alluvial fans, high stream terraces, and glacial outwash terraces for the Rising Sun developed area nearer the GTSR. The proposed project would cause some disturbance and degradation of soils in the project area; impacts to soils are therefore analyzed.

Historic Structures and Cultural Landscapes

The weir and Rose Creek Bridge were determined to not meet the criteria for listing in the National Register of Historic Places and therefore are not historic. However, three historic structures including the Going-to-the-Sun Road, the Rising Sun Auto Camp Historic District, and the Rising Sun Campground Camptender's Cabin are located in the Area of Potential Effect (APE) for this project. The Going-to-the-Sun Road is listed in the National Register of Historic Places and is a designated National Historic Landmark. The Rising Sun Auto Camp Historic District and the Rising Sun Campground Camptender's Cabin are listed in the National Register. These two structures are physically removed from but visually within the APE of the bridge replacement project. The National Historic Landmark designation of the Going-to-the-Sun Road also recognized the road's exceptional significance as a cultural landscape; the road is Glacier National Park's only fully documented cultural landscape. Historic structures and cultural landscapes are therefore analyzed.

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
- impacts have been determined to be minor or less without or with the application of mitigation measures. Additionally, 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 not be measurable. 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, cumulative effects is presented.

For purposes of this section, an impact of negligible intensity is one that is at the lowest levels of detection, barely perceptible, and not measureable. An impact of minor intensity is one that is measureable or perceptible, but is slight, localized, and would result in a limited alteration or a limited area. The rationale for dismissing the specific topics is stated for each resource.

Wildlife

The NPS is charged with maintaining native wildlife as an integral component of natural ecosystems. Noise and human activity associated with the proposed actions could temporarily disturb individuals of some wildlife species. But the work would be localized to the weir and bridge sites and undisturbed habitat would remain available, especially to 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 their habitat and any disturbances would be short-term. Impacts to wildlife would be negligible to minor, and are not further analyzed.

Threatened and Endangered Species and Species of Concern

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; consequently, there would be no effect to Spalding's catchfly or water howellia from the proposed project. However, if locations of listed plant species become known within the vicinity of the project area, the plants would be avoided.

Grizzly Bear (*Ursus arctos horribilis*). Federally listed as Threatened. Grizzly bears have been observed in the lower Rose Creek drainage, and some bears travelling through the area could be temporarily disturbed or displaced by noise and human activity from the proposed actions. Grizzly bear habitat modeling by the Cumulative Effects Model (CEM) Working Group indicates that grizzly bear habitat values in the immediate vicinity of the project sites are low during summer and autumn (CEM 2004, based on findings from Mace et al., 1999). The Rose Creek Bridge is also within Management Situation 3, where grizzly bear habitat maintenance is not a management consideration and grizzly bear presence and factors contributing to their presence would be actively discouraged (NPS 2010). Because the project would occur in autumn, be of short duration and low intensity, and would be localized to the weir and bridge sites, impacts to grizzly bears would be negligible; under Section 7, the project would have no effect to grizzly bears. Impacts to grizzly bears are therefore not further analyzed.

Canada Lynx (*Lynx canadensis*). Federally listed as Threatened. While potential lynx habitat exists in the lower Rose Creek drainage, there is only one recorded lynx sighting from the area. The proposed actions would not measurably affect lynx, given the project's short duration and low intensity, and because the work would be localized to the weir and bridge. Impacts to lynx would be negligible; under Section 7, the project would have no effect to lynx, and impacts to the species are not further analyzed.

Wolverine (*Gulo Gulo***).** Candidate Species. The USFWS defines a candidate species as "a species under consideration for official listing for which there is sufficient information to support listing" (USFWS 2011). There is one report of a wolverine sighting from the lower Rose Creek drainage. Wolverines are highly mobile, wide ranging carnivores and would not be measurably affected by the proposed actions, which would be short-term and of low intensity. Wolverines are therefore dismissed from further analysis.

Meltwater Stonefly *(Lednia tumana).* Candidate Species. Lower Rose Creek has been determined to not provide suitable habitat for the meltwater stonefly, and

it is highly unlikely that the species is present. The meltwater stonefly is not analyzed because it would not be impacted by the project.

Species of Concern. Several state listed bird species of concern could occur within the project area, but none would be measurably impacted by either the weir removal or the bridge replacement. Only two small, localized geographic areas would be affected and the majority of the work would occur in the fall after the critical nesting period for most species. Species inhabiting forested and riparian areas near the weir could be disturbed, but disturbances would be short-term with impacts that are minor or less. The bald eagle (*Haliaeetus leucocephalus*) nest on St. Mary Lake is over two miles from the project area. While bald eagles may forage near the Rose Creek inlet in the fall, the bridge is approximately 300 meters (approximately 0.2 mile) away, separated from the lake by a forested visual buffer, and the work site and associated equipment would not be readily visible to eagles foraging or perching near the shoreline. The distances between the project areas and the bald eagle nest and foraging area at the Rose Creek inlet are well within the guidelines for recommended distance buffers established by the state in the *Montana Bald Eagle Management Guidelines* (Montana Bald Eagle Working Group 2010). Additionally, the golden eagle (*Aquila chrysaetos*) nest on Otokomi Mountain, last active in 2007, is over 1200 meters (approximately ¾ mile) from the weir and 1700 meters (approximately 1.0 mile) from the bridge. Golden eagles could initiate nesting closer to the project areas, but high intensity work activity, including demolition, would occur after the nesting period. Rock facing and stone masonry and any other remaining work on the bridge the following spring would be of low intensity, similar to or less than existing levels of human activity, including snow plowing. Disturbances to bald or golden eagles would be highly unlikely, and bird species of concern are therefore not further analyzed.

State listed mammalian species of concern that occur or may occur in Glacier National Park include the Townsend's big-eared bat (*Corynorhinus tonsendii*), hoary bat (*Lasiurus cinereus*), Preble's shrew (*Sorex preblei*), northern bog lemming (*Synaptomys borealis*), and fisher (*Martes pennanti*) (MNHP 2011). Although bats are present in the area, neither the Rose Creek weir nor the bridge as designed is habitable by bats, and no bat species would be impacted by the project. There are no records of the Preble's shrew in the park, and no records of the northern bog lemming in the lower Rose Creek drainage; neither the weir nor the bridge is located in an area that is likely to provide optimal habitat for either species. Fishers may inhabit forested areas adjacent to the weir site, but since the work would be limited to the stream bed, neither fishers nor their habitat would be measurably affected. Mammalian species of concern are therefore not further analyzed.

Neither of the park's two amphibian species of concern, the western toad (*Bufo boreas*) and the northern leopard frog (*Rana pipiens*), has been documented in the Rose Creek drainage. Transient use of the area by amphibians is likely, but sampling in the drainage has failed to document their presence. Any amphibians that are present are likely to be at very low abundance, and the proposed actions would not measurably impact any known local populations or their habitat. The area would be surveyed immediately prior to beginning work, and any amphibians encountered would be moved out of the immediate work area. Amphibian species of concern 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 not further analyzed.

Vascular Plants. No rare plants or rare plant habitats have been identified within the vicinity of this project. This topic is therefore dismissed.

Wetlands

The definition of wetlands under the Clean Water Act is "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 United States Army Corps of Engineers to prohibit or regulate the discharge of dredged material, fill material, or excavation within US 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, the potential adverse impacts of proposed actions must be addressed in a separate statement of findings (SOF). The project area was surveyed for wetlands, and no evidence of wetland hydrology was observed. Therefore, according to the defining criteria for wetlands under the 1987 Corps of Engineers Wetlands Delineation Manual, there are no wetlands in the project area, and this impact topic is eliminated from further study.

Air Quality

The Clean Air Act provides for special protection of air quality and air resources in all National Park Service units. Section 118 of the Clean Air Act requires parks 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 either of the alternatives, and impacts to air quality are not analyzed.

Climate

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). The proposed project is of a small scale, would not change visitor use patterns, is not likely to result in increased or reduced greenhouse gas emissions, and therefore is not expected to measurably impact the global climate. Impacts to the climate have therefore been dismissed from further analysis.

Recommended Wilderness

Ninety-five percent of Glacier National Park is recommended wilderness. Wilderness in the park is defined as lands that are essentially undeveloped or are natural in character and lie at least 200 feet from the centerline of paved roads,

50 feet from unpaved roads, and 300 feet from developed areas. NPS policy requires that proposed or recommended wilderness be managed as designated wilderness until the land is either formally designated or rejected. Both the Rose Creek weir and bridge are outside the recommended wilderness boundary, and recommended wilderness is therefore dismissed from further analysis.

Natural Soundscapes

An important part of the NPS mission is to preserve the natural soundscapes of national parks. The removal of the weir on Rose Creek would likely generate noise ranging between 90 and 95 dBA 50 feet from the source over a period of one to two weeks. Heavy equipment used for hauling away debris would produce noise for much of the duration of the project; the use of expansive demolition grout to fracture the concrete rather than mechanically breaking it apart would minimize the amount of noise. Replacing the bridge would generate noise at a similar level, but bridge replacement would require approximately 12 weeks, resulting in a longer period of temporary noise. In general, higher noise levels would be expected during demolition of the bridge (approximately 90 dBA or less) than during construction (approximately 81 dBA or less). Noise levels would spike to about 110 dBA 50 feet from the source during pile driving for the new abutments, but pile driving would occur temporarily and intermittently over about a two day period.

Noise produced during both the removal of the weir and the replacement of the bridge would likely attenuate (reduce in amplitude) due to vegetation and topography. The project area for the weir is forested and is located within a stream bed, and trees and natural stream sounds would dampen artificial noise. Noise reduction from vegetation and topography are difficult to quantify. Accounting for an initial attenuation of 10 dB from topography and vegetation (Washington State Department of Transportation 2011), noise from heavy equipment and general construction activities during weir removal and bridge replacement would likely reduce to 50dB within 0.4 mile, and noise spikes from pile driving during bridge construction would likely reduce to 50 dB within 3.0 miles. Fifty dB is the typical noise level for light automobile traffic (Washington State Department of Transportation 2011), so artificial noise produced during the proposed actions would not substantially exceed that which already exists within the road corridor.

Few visitors would be impacted by noise from the proposed actions since the work would occur after Rising Sun Campground and concessions operations are closed for the season. Noise disturbances would adversely affect wildlife, possibly causing some individual animals to temporarily avoid the project areas. But wildlife would not be measurably affected since sensitive breeding, nesting, denning, and rearing periods for resident wildlife species would be over by the time the project(s) are underway, noise from the weir removal and pile driving would be very temporary (one to two weeks for weir removal and approximately two days for pile driving), and noise from the bridge work would be intermittent and short term. Impacts to visitors and wildlife from artificial noise would therefore be minor or less, and impacts to the natural soundscape are dismissed from further analysis.

Archeological Resources

The Areas of Potential Effect of the proposed actions have been surveyed for archeological resources and none were identified. If archeological resources are

identified during construction, consultation with the State Historic Preservation Office and Tribal Historic Preservation Offices would occur in accordance with federal legislation and regulations and National Park Service policy. Archeological resources are therefore dismissed.

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). The proposed actions are not expected to impact ethnographic resources. Neither the Blackfeet Tribe nor the Confederated Salish and Kootenai Tribes raised concerns about the proposed action during scoping for the project and, therefore, ethnographic resources have been dismissed from further evaluation. 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 will occur in accordance with federal legislation and regulations and National Park Service 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.

Visual Resources

Replacing the existing Rose Creek Bridge with one that appears more compatible with the historic design characteristics of the GTSR would benefit the visual appearance of the bridge site, and removing the weir upstream of the Rising Sun developed area would restore the natural appearance of the immediate stream environment. The changes to the bridge would affect a limited portion of the viewshed near Rising Sun, but the absence of the weir would only be detectable by visitors who venture off the Otokomi Lake Trail to the creek. Some temporary adverse effects to visual resources would be expected during demolition of the weir and bridge and during bridge construction. Any effects to visual resources would be negligible to minor since they would occur over a limited area. Because there would be no measurable impacts to visual resources, the topic is dismissed from further analysis.

Visitor Use and Experience

Long-term visitor use of the project sites would not be affected, but visitor experience would benefit over time from a bridge that is structurally sound for the long term, and by the benefits to visual resources described above. Visitor use and experience would be slightly impacted for the short term during the work periods for each action, especially during bridge replacement when GTSR traffic would be temporarily re-routed over the bridge to Rising Sun Campground. Bridge replacement would occur after the Rising Sun campground and concession operations close for the season, and visitor use of commercial services in the Rising Sun developed area would not be affected. Impacts to visitor use and experience would be negligible to minor, and are not analyzed further.

Human Health and Safety

The 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. There would be no impacts to human health and safety from either alternative and the topic is dismissed from further analysis.

Socioeconomic Resources

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.

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).

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 actions proposed in the preferred alternative. Therefore, environmental justice was dismissed from further analysis.

ALTERNATIVES CONSIDERED

An interdisciplinary team of Glacier National Park staff with assistance from Federal Highway Administration engineers originally identified three alternatives, including a no action alternative. Public scoping identified one additional alternative and several suggestions. After further consideration, only the no action alternative and one action alternative have been carried forward for further evaluation. The other alternatives have been dismissed and are discussed under *Alternatives, Suggestions, and Concerns Considered but Eliminated from Detailed Study*.

Alternative A: No Action Alternative

The no action alternative describes the conditions that would continue to exist on Rose Creek if no plan was implemented. The no action alternative provides a baseline for evaluating the changes and related environmental impacts that would occur under the action alternative.

Under this alternative, the Rose Creek weir would not be removed and the Rose Creek Bridge would not be replaced.

Alternative B: Preferred Alternative

Removal of the weir on Rose Creek. Under Alternative B, the weir on Rose Creek would be removed. Attempts would be made to remove the structure across the entire width of the stream down to the bedrock anchor point, but some concrete could remain where the weir is anchored into the bedrock. The weir would be fractured with expansive demolition grout and the large pieces would be removed by an excavator or similar equipment. Specialized saws would cut the rebar and reinforcing steel. Expansive demolition grout is a powder that is mixed with water and poured into pre-drilled holes. As the grout cures, it expands with substantial force, causing the material in question to fracture. Expansive grout does not produce airborne debris or explosive noise, and can be used above or below the surface of water. The grout would be removed from the stream along with the concrete and rebar. The removal of the weir would occur in September when stream flows are lowest and would likely require one to two weeks. The project would be funded by the U.S. Fish and Wildlife Service.

Equipment (such as an excavator or frontend loader) accessing the creek would do so from the water tank road, which abuts the stream channel within 100 meters downstream of the weir. Equipment capable of "walking" up the stream channel with minimal direct contact with the streambed would be used, and/or equipment would be supported by some form of work pad as necessary to minimize impacts to the streambed. Loose boulders within the streambed may be temporarily moved out of the path of machinery; any removed boulders would be replaced.

The concrete would be removed until it is level with the streambed or no longer presents a barrier to fish passage; a low concrete sill could remain on the streambed. Protruding segments of abandoned metal water pipe would be cut level with the streambed. The removed concrete and rebar would either be temporarily stockpiled onsite and hauled out one load at a time, or placed in a large steel container that would be hauled out when full and brought back for additional loads. With either method, approximately 12 trips would be required, depending on the capacity of the frontend loader or container. Fewer loads would be anticipated with the container.

During excavation, some sediment on the weir's upstream side could be removed to reduce the amount of sediment released downstream once the weir is removed. Whether sediment is removed would depend on how well the material is being naturally transported and redistributed by the stream channel. It is likely that sediment generated by the project would be

transported and redistributed during high water the following spring. Removal of the weir is likely to disturb less than one acre of soil and vegetation.

The Rose Creek Bridge. Under Alternative B, the Rose Creek Bridge would be replaced with a new, approximately 85 foot-long, concrete girder, clear span bridge (Appendix A). A clear span bridge was selected because it would require no footings, pilings, or piers in the stream channel and would therefore be more conducive to fish passage and natural hydraulics than other bridge designs. A clear span bridge would also reduce adverse impacts on sediment transport and channel morphology, and could require less future maintenance due to increased hydraulic capacity. Multiple span bridges or those with culvert designs do not allow sediment to pass as well as clear span designs, result in upstream aggradation and downstream scouring, and can become clogged with debris.

The existing bridge would be demolished and all concrete and reinforcing steel would be removed and hauled to a disposal site outside the park. The existing girders may be removed without the need for work crews or equipment to access the creek, but some in-stream work involving hand-tools and an excavator would be required to cut the piers and concrete sill into manageable pieces and remove them. The stream may be temporarily diverted as necessary during demolition and removal of the concrete sill, and some native material may be excavated. The amount of excavated material would depend on whether there are voids beneath the sill. Once the piers and sill are removed, the stream channel may be graded as necessary through the project area to match upstream and downstream elevations, and shaped to match adjacent existing conditions.

Following demolition, the abutments for the new bridge would be constructed. Because the new bridge would be longer than the existing bridge, excavation for the abutments would occur well away from the stream. Riprap would likely be required to armor and protect the abutments. An approximate total of 1200 cubic yards of native material above the ordinary high water mark and 210 cubic yards of native material below the ordinary high water mark would likely be excavated. Recontouring the banks for riprap and placing the material may require equipment within the stream channel. Less than one acre of soil and vegetation would likely be disturbed.

New concrete girders would be fabricated off-site, trucked to the project area, and put in place by cranes on either side of the bridge. The abutments would be backfilled and the approach roadways would be constructed. A cast-in-place concrete deck would be poured and the railing and wing walls would be faced with ashlar or rubble stone, making the appearance of the new bridge would more compatible with the historic design characteristics of the Going-to-the-Sun Road.

Demolition of the bridge would begin in mid to late September, concurrent with end-of-season closures at Rising Sun Campground and concessions operations, and when stream flows are low and traffic on the GTSR is at a decreased level. Bridge demolition could occur during the same time period as the removal of the weir, and construction of the abutments and installation of the new girders could extend through December, with all in-water work being completed during the low-flow period. Work could occur at night to accelerate the schedule. Rock facing and stone masonry, as well as any other remaining work, would take place early the following spring. During the bridge replacement, traffic on the GTSR would be detoured over the bridge to Rising Sun Campground (Figure 5).

The new bridge would be designed to easily accommodate bears and other terrestrial wildlife trying to move through the area. Because bats are attracted to concrete bridges, particularly when they warm up during the day and hold the heat at night, bat boxes would be placed underneath the bridge to provide roosting areas for bats. The replacement of the Rose Creek

Bridge would be funded by the Federal Lands Highway Program as part of the GTSR Rehabilitation Project.

Following implementation of both projects, fish sampling would be conducted annually in Rose Creek for approximately five years to document any expanded use of Rose Creek by native fish. Sediment transport would be assessed through the establishment of stream channel cross-sections and substrate assessments.

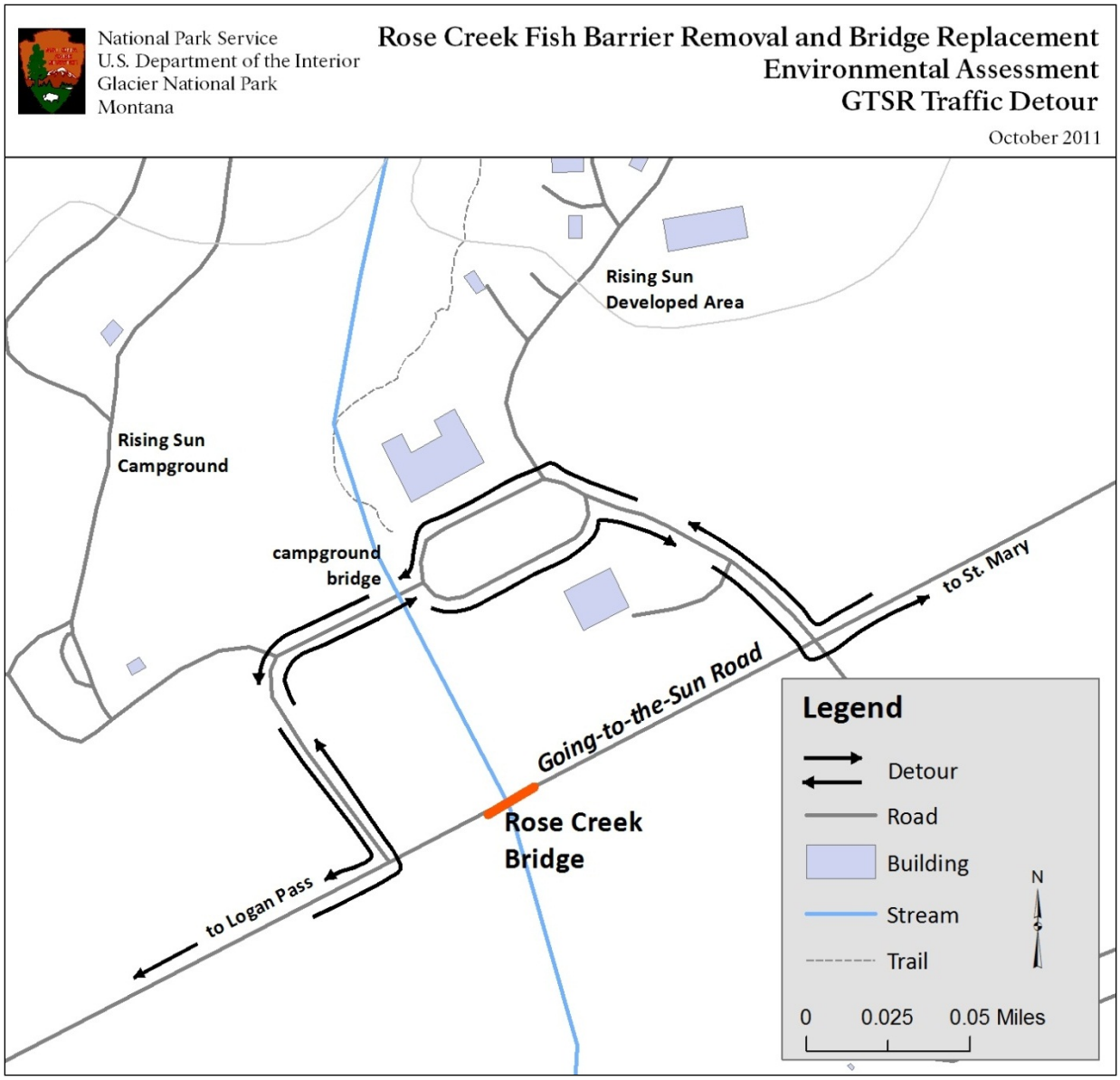

Figure 5: Proposed GTSR traffic detour during the replacement of the Rose Creek Bridge.

Mitigation Measures

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

Fisheries and Aquatic Threatened Species and Species of Concern

- Electrofishing to remove fish would occur in the project vicinity immediately prior to excavation activities.
- Work would occur during low water periods, minimizing sediment generation and physical habitat disturbance.
- Any disturbance to physical stream habitat would be repaired upon completion of the project.
- Work pads would be used with heavy equipment as necessary to minimize sediment generation and streambed disturbance.
- Surveys for amphibians would be conducted immediately prior to excavation and in-stream work, and any amphibians encountered would be moved out of the immediate work area.

Water Resources

- Specific stream access points for heavy equipment would be identified to minimize stream bank damage and bed disturbance.
- Work pads would be used with heavy equipment as necessary to minimize sediment generation and streambed disturbance.
- Water would be temporarily diverted as necessary away from areas of excavation by sandbags or a similar barrier.

Wildlife

- The new bridge design would provide clearance for terrestrial wildlife to pass underneath the structure during low-water periods.
- Work crews would be trained on appropriate behavior in the presence of wildlife and on proper storage of food, garbage, and other attractants.
- Hauling trucks (such as dump trucks, tractor trailers, and other large trucks hauling construction debris and heavy equipment) would not operate during late evening, nighttime, or early morning hours (from one hour before sunset to one hour after sunrise) to reduce the risk to wildlife of being struck by a vehicle.
- Bridge work scheduled for the spring would not begin until after April 1, in keeping with the park's road closure and core security periods for wildlife protection.
- In the event that golden eagles are nesting within 800 meters of the project area when work is underway, work would not begin until one hour after sunrise and would cease one hour before sunset between April 1 and August 1. This restriction would continue beyond August 1 if fledging is late, and would be lifted early if the nest is unsuccessful.

Vegetation

- 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.
- A vegetation inventory would be completed at the start of the project. If restoration is necessary following project completion, native species from the site would be utilized for revegetation seeding and planting efforts. Plant species density, abundance, and diversity would be restored as nearly as possible to prior conditions for non-woody species.
- Non-native invasive plant infestations near the bridge would continue to be treated on a

yearly basis, with emphasis on disturbed areas at both the bridge and weir for a minimum of three years following project completion.

Soils

- Glacier National Park's Best Management Practices would be implemented to minimize the extent of impacts.
    - Disturbance to soils 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.
- Any ground surface temporarily disturbed during construction would be aerated and replanted with native vegetation to reduce compaction and prevent erosion.
- Following bridge construction, all disturbed top soil would be salvaged, stored, and used to restore the area.

Cultural Landscapes

- The new Rose Creek Bridge would be designed to meet the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Visitor Use and Experience

- Bridge demolition and construction would not begin until after the peak visitor season, when concessions operations and the campground at Rising Sun have closed for the season and traffic on the GTSR is at a decreased level.
- During bridge demolition and construction, traffic on the GTSR would be redirected over the Rising Sun Campground bridge (see also Figure 5).

Alternatives, Suggestions, and Concerns Considered But Eliminated From Detailed Study

This section discusses one previously identified alternative, two dismissed methods for removing debris from the weir project area, one dismissed method for fracturing the weir, one dismissed method for accessing the weir, and suggestions from scoping that were considered but dismissed. Other comments and concerns raised during scoping are also addressed.

Install a fish ladder at the weir site. A fish ladder as an alternative to removing the weir was considered and dismissed because it would not meet the objectives of restoring natural fish passage and improving sediment transport, and it would be more costly to maintain. Successful upstream fish passage would not be ensured.

Fracture the weir with explosives. Using explosives to fracture the concrete weir was considered but dismissed in favor of expansive demolition grout due to the higher overall hazards associated with explosives as well as noise considerations.

Carry the demolished concrete away from the weir site by hand. For the concrete to be hand carried out of the area, it would need to be demolished into very small pieces, producing additional artificial noise and prolonging the amount of time that heavy equipment would be in the stream. Carrying the concrete away by hand would require multiple trips and cause greater trampling of vegetation and soils along the stream bank. There would also be considerable safety risks with this approach, since work crews would be carrying heavy loads over uneven terrain.

Transport the demolished concrete away from the project area over adjacent terrain instead of the streambed. Transporting the debris over land would cause excessive long-term compaction and trampling to soils and vegetation. Equipment accessing the creek from the water tank road within 100 meters of the weir would have less of an overall negative effect on the area, and would only temporarily impact the streambed. Negative impacts to the streambed would be lessened by some form of work pads used to support the equipment as needed.

Access the weir by driving an excavator up the trail and reaching the weir from an upstream access point. This approach would have greater impacts to soils and vegetation than would walking an excavator up the stream channel from the water tank road. Multiple trips back and forth to access the weir and remove the material would create a two-track road from the Rising Sun guest cabins to a point adjacent to the weir; the road would be a long-term impact that would remain on the landscape for several years. The disturbance to soils and native vegetation would also increase the potential for non-native invasive plant species to become established.

Comment: *Instead of replacing the bridge,* c*ould the flow channel be fixed to allow fish passage, and the bridge structurally and aesthetically retrofitted in place, faced with stone and fitted with railings that look appropriate for a historic highway?* **Response:** Sediment transport within the stream channel cannot be improved without removing the concrete sill that connects the bridge's footings and spans the width of the stream. Also, the bridge's span is too narrow to accommodate natural shifts in the stream channel over time and the abutments are beginning to settle, threatening the bridge's long-term structural stability. Retrofitting the bridge's structural and aesthetical components would not adequately address these issues. The bridge has also been retrofitted in the past, which has caused many of its structural concerns. This suggestion has therefore been dismissed.

Comment: *The scoping brochure gives no information about what fish species are currently located downstream of the barriers. Providing fish passage may inadvertently provide new access to invasive species such as rainbow trout, brook trout, and others.* **Response:** Longnose dace (*Rhinichthys cataractae*), brook trout (*Salvelinus fontinalis*), burbot, bull trout, sculpin

(*Cottus sp.*) and cutthroat trout (likely hybrids) have been captured in Rose Creek downstream of the diversion structure. There are currently no fish present upstream of the project area between the weir and an impassable falls. It is most likely that bull trout would have the highest potential to benefit because they would be able to access high-gradient habitat upstream of the weir that may continue to remain inaccessible to smaller salmonids, such as non-native brook trout. Most of the fish species documented in Rose Creek to date are native. On balance, the potential benefits to native fish outweigh any potential risk caused by also providing access for non-native fish.

Comment: *Consider removing one barrier and then monitor the change in the fish community for a few years before removing the other barrier. This could bolster confidence that removing a barrier was beneficial, and could also reduce impacts to the channel as it adjusts to a new bedload.* **Response:** This suggestion was considered and dismissed because maximum benefit would be achieved by removing both barriers simultaneously. The area between the two existing barriers alone is likely too small to clearly demonstrate the benefits of removing only one barrier. In addition, impacts from disturbance would be lower if both barriers are removed at the same time, rather than to go back into the stream with heavy equipment a second time to remove the second barrier. These barriers are man-made structures and restoring natural processes as well as the physical template of the landscape is consistent with NPS management policies.

Comment: *Consider doing long-term monitoring to see if the project has been successful for fish and sediment transport.* **Response:** Following implementation, the park would conduct fish sampling annually in Rose Creek for approximately five years to document any expanded use of Rose Creek by native fish. Sediment transport would be assessed through the establishment of stream channel cross-sections and substrate assessments.

Comment: *Consider indenting the year of bridge construction in the concrete in the railing end so drivers can see it as they drive up to the bridge.* **Response:** This is a good suggestion and will be considered during the design phase.

Comment: *Consider building the bridge from peeled logs and timbers rather than the much more expensive rubble stone. In 1932, were there not bridges so built in national parks?* **Response:** Some bridges in national parks were built of logs and timbers, but there were not any major log structures on the Going-to-the-Sun Road, and a bridge constructed from peeled logs and timbers would not be compatible with the road's historic design characteristics. A peeled log and timber bridge would also require more frequent and costly maintenance. For these reasons, this was considered but dismissed.

Alternative Summaries

Table 1 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, the no action alternative achieves none of the project objectives while the preferred alternative achieves all of the project objectives.

Table 1: Summary of alternatives and how each alternative meets project objectives.

Alternative Elements	Alternative A – No Action	Alternative B – Remove the Weir and Replace the Bridge
The weir on Rose Creek	The abandoned weir on lower Rose Creek would not be removed.	The weir would be fractured with expansive demolition grout; large pieces would be removed by an excavator or similar equipment and specialized saws would cut the rebar and reinforcing steel.
Abandoned metal pipe protruding from the streambed	Segments of abandoned metal water pipe would not be removed.	Segments of abandoned pipe would be cut level with the streambed.
Removal of weir debris	The weir would not be removed, and there would be no debris to remove.	Debris from the weir would be stockpiled and removed, or put in a large container that would be hauled out when full.
The Rose Creek Bridge	The bridge, which is showing signs of structural instability, would not be replaced.	The bridge would be replaced with an approximately 85 foot-long, concrete girder, clear span bridge; the existing bridge would be demolished and all debris would be removed; riprap would likely be required at the abutments.
Demolition, construction, and excavation	The bridge would not be replaced, and no construction or excavation would be needed.	The girders may be removed without accessing the creek; new girders would be fabricated off-site and trucked in; some in-stream work would be necessary to cut and remove the piers &concrete sill and install riprap; the stream may be temporarily diverted during demolition; some native material may be excavated.
Stream channel morphology	Existing stream channel morphology would remain as is.	The stream channel may be graded and shaped to match elevations and adjacent conditions.
Compatibility with GTSR historic design elements	No changes would be made to the appearance of the bridge to make it more compatible with GTSR historic design elements.	A cast-in-place concrete deck and railings and wing walls faced with ashlar or rubble stone would make the appearance of the new bridge more compatible with the historic design elements of the GTSR.
Project Objectives	**Meets Project Objectives?**	**Meets Project Objectives?**
Restore fish passage on Rose Creek to provide access to historic spawning and rearing habitat for native fish.	No. Fish passage on lower Rose Creek would remain blocked by the weir and the bridge; fish would not be able to access additional habitat for spawning and rearing.	Yes. Two fish barriers would be removed from lower Rose Creek, increasing the amount of accessible spawning and rearing habitat for native fish.
Improve sediment transport along lower Rose Creek.	No. Sediment transport within lower Rose Creek would not be improved; sediment scouring and degradation of the natural stream channel would continue.	Yes. Two barriers to the natural movement of sediments in Rose Creek would be removed and sediment transport would be improved.
Address the structural concerns and incompatible historic design elements of the Rose Creek Bridge.	No. The structural integrity of the existing Rose Creek Bridge would become increasingly compromised, and the bridge would require increased long-term maintenance. The bridge's appearance would remain incompatible with the historic design characteristics of original structures and other features along the GTSR.	Yes. A new, clear span bridge that could accommodate shifts in the stream channel over time and require less maintenance would replace the existing bridge, which has begun to show signs of structural instability. The appearance of the new bridge would be more compatible with the Going-to-the-Sun Road's historic design principles.

Table 2 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 section provides a more detailed explanation of these impacts.

Table 2: Environmental Impact Summary by Alternative.

Impact Topic	Alternative A – No Action	Alternative B – Preferred
Fisheries/Aquatic Threatened and Species of Concern		
Bull Trout	Minor, adverse, local, and long-term due to limited accessibility to historic spawning and rearing habitat. Under Section 7, the determination would be "may affect, not likely to adversely affect".	Negligible to minor adverse, site-specific, and short-term due to temporary turbidity and habitat disturbances during project implementation. Moderate beneficial, local, and long-term due to increased availability of historic stream habitat. Under Section 7, the determination would be "may affect, not likely to adversely affect".
Westslope Cutthroat Trout	Negligible to minor, adverse, local, and long-term due to limited availability of stream habitat.	Negligible to minor adverse, site-specific, and short-term due to temporary turbidity and habitat disturbances during project implementation. Minor, beneficial, local, and long-term due to increased habitat availability.
Burbot	Negligible to minor, adverse, local, and long-term due to limited stream habitat availability.	Negligible to minor adverse, site-specific, and short-term due to temporary turbidity and habitat disturbances during project implementation. Negligible to minor beneficial, local, and long-term due to improved accessibility to historic stream habitat.
Water Resources	Minor adverse, site-specific, and long-term from unabated sediment scouring and stream channel degradation.	Minor to moderate adverse, site-specific, and short-term from a temporary release of upstream sediments, limited use of heavy equipment in the stream channel, and recontouring of the stream bed. Minor long-term, site-specific, beneficial impacts from restoration of more natural sediment transport regime.
Floodplains	Negligible to minor, adverse, site-specific, and long-term from ongoing obstructions to flood flows at the Rose Creek Bridge.	Negligible to minor, site-specific, and long-term beneficial due to the removal of restrictions to flood flows along lower Rose Creek. Negligible adverse, site-specific, and long-term due to the new abutments, which would displace some water during flood flows over a short distance of the stream. Negligible adverse, site-specific, and short-term from disturbances during project implementation.
Vegetation	None	Minor adverse, site-specific, and short-term from disturbance, compaction, and the loss of some individual plants.
Soils	Negligible to minor adverse, long-term, and site-specific impacts would continue from ongoing sediment aggradation, channel widening, and erosion of the stream banks.	Minor adverse, site-specific, and short-term from degradation, compaction, and disturbance. Minor beneficial, site-specific, and long-term impacts would occur from improved sediment transport and reduced stream bank soil erosion.
Historic Structures and Cultural Landscapes	None	Minor beneficial, long-term, site-specific and local from a new bridge that would appear more compatible with the historic design characteristics of the GTSR.

Environmentally Preferred 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 (removal of the weir and replacement of the bridge) is the environmentally preferable alternative for several reasons: 1) The amount of accessible spawning and rearing habitat for native fish, including the threatened bull trout, would increase along lower Rose Creek; 2) sediment transport and stream function along lower Rose Creek would improve and more closely resemble natural conditions; 3) a bridge that is showing signs of structural instability would be replaced with a new, clear span bridge that could accommodate shifts in the stream channel over time; 4) a bridge with features that are incompatible with a National Historic Landmark, the GTSR, would be replaced with one that is more compatible with the historic design principles of the GTSR.

By contrast, Alternative A (No Action) is not the environmentally preferable alternative because 1) native fish would remain blocked from accessing historic spawning and rearing habitat; 2) the natural morphology of the lower Rose Creek channel would be degraded for the long-term by continued sediment scouring; 3) a bridge that has begun to show signs of structural instability would not be replaced; 4) the existing Rose Creek Bridge would remain incompatible with the historic design characteristics of the GTSR, a National Historic Landmark; and 5) an abandoned concrete weir would remain in an otherwise pristine setting.

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 & ENVIRONMENTAL CONSEQUENCES

This section examines all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Actions are analyzed for their direct and indirect effects. Direct effects are impacts that are caused by the alternatives at the same time and in the same place as the action. Indirect effects are impacts caused by the alternatives that occur later in time or are farther in distance from the action. Potential impacts are described in terms of context, duration, and intensity (Table 3).

- **Type:** impacts are either *beneficial* or *adverse*. A resource may be affected both beneficially and adversely (e.g., one wildlife species may benefit while another is harmed), however an overall impact for the resource as a whole is determined.
- **Spatial Context:** impacts are 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:** impacts are short-term or long-term. The definitions for these periods depend upon the impact topic and are described in Table 3.
- **Intensity:** the impacts are *negligible, minor, moderate*, or *major*. Definitions of intensity vary by impact topic and are provided in Table 3.

The NPS equates “major” effects as “significant” effects. The identification of “major” effects in the preferred alternative or proposed action would trigger the need for an EIS. Where the intensity of an impact can be described quantitatively, the numerical data is presented; however, most impact analyses are qualitative and use best professional judgment.

Effects to historic properties listed in or eligible for listing in the *National Register of Historic Places* also have been described in accordance with *Section 106* of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, *36 CFR 800*. Effects to federally listed species have also been described in accordance with Section 7 of the Endangered Species Act.

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 limited to the Rose Creek drainage for water resources, vegetation, and soils; for the analysis of cumulative impacts to cultural resources, the geographic scope encompasses the Rising Sun developed area and the GTSR. The geographic scope for the analysis of cumulative impacts to fisheries includes the St. Mary drainage. Given this, the following projects were identified for the purpose of conducting the cumulative effects analysis, listed from past to future:

Past Actions

- *Going-to-the-Sun Road Rehabilitation.* Rehabilitation of the GTSR has been underway for several years, with work occurring along various segments of the road since the early 1990's. Large scale rehabilitation of the alpine section began in 2006 on the west side of the Continental Divide. East of Logan Pass, work has included repairs to flood damaged sites and reconstruction of the St. Mary Visitor Center parking lot. Rehabilitation between Logan Pass and Siyeh Bend began in 2010 and was completed in the late fall of 2011. Rehabilitation activity has required heavy equipment, hauling trucks, and large work crews. Road work has typically begun in early spring and ended in late fall, depending on weather conditions.

  GTSR rehabilitation work in the vicinity of Rising Sun was underway during 1992-1994, and included a redesign of the parking lot between the camp store and the restaurant, improvements to the picnic area and boat launch, and riprap installation at the Rose Creek Bridge, among other actions. Excavation at the bridge broke through a natural sedimentary seal and stream flow was inadvertently diverted underground; the diversion soon corrected itself, and the stream recovered. Rehabilitation of approximately 1.5 miles of the GTSR was also underway at this time, and included sub-excavation, paving, and culvert replacement, among others. Following this work, vegetation was restored on 0.64 acres along Rose Creek and 2.0 acres within the Rising Sun developed area. A severe flood washed over all newly restored soils and vegetation in June of 1995; some vegetation was restored following the flood.

- *Projects Identified Under the GNP Commercial Services Plan.* As one of the actions called for in the GNP *Final Commercial Services Plan*, a new boat tour ticketing office at Rising Sun was constructed above the high-water mark in the spring of 2011. The new office is located next to the sidewalk east of the comfort station. The former ticketing office, which is in poor condition and was prone to flooding during high water events, will likely be removed in the spring of 2012.

On-going Actions

- *Going-to-the-Sun Road Rehabilitation.* In 2011, rehabilitation of the GTSR began in mid-April and is expected to continue until late fall; the duration of the work season will be determined by the onset of winter weather conditions. Areas both east and west of the Continental Divide are undergoing work; the section between Big Bend and Siyeh Bend is expected to be completed in the fall of 2011. The GTSR rehabilitation project as described in the *Rehabilitation of the Going-to-the-Sun Road Plan/Final Environmental Impact Statement (2003)* is anticipated to be completed in the fall of 2016, depending on available funding.

Future Actions

- *Going-to-the-Sun Road Rehabilitation.* Rehabilitation of the GTSR is anticipated through the fall of 2016, depending on weather and available funding. Alpine sections of the road are expected to be completed by spring of 2013. The segment between Siyeh Bend and Rising Sun is anticipated to begin in 2013 and continue until the fall of 2014 or the spring of 2015. The Rising Sun to St. Mary segment is expected to occur in 2014; while construction plans for this section have not been started, sub-excavation work, culvert replacements, and a pavement overlay could occur in the vicinity of Rising Sun and Rose Creek. Periodic night work, heavy equipment, hauling trucks, and large work crews are expected, and Sun Point will be the likely staging area. Depending on weather conditions, work would likely begin in spring and continue until late fall.

- *St. Mary Falls Trailhead Parking Upgrade*. The GTSR Rehabilitation Plan/Final

Environmental Impact Statement calls for an upgrade to the narrow parking pullout at the St. Mary Falls trailhead. The upgrade is necessary for safe vehicle entry and exit and to allow for separation between pedestrians and vehicles. The parking pullout could be expanded, or parking could be relocated or augmented nearby. It is likely that a new retaining wall will be required. The parking upgrade would likely occur in 2013. Depending on the extent of disturbance, a separate environmental assessment may be prepared. The project would be constructed as part of the GTSR Rehabilitation Project under the Federal Lands Highway Program.

- *The Bureau of Reclamation's St. Mary Dam Replacement and Modifications Project.* A Bureau of Reclamation (BOR) water diversion structure outside the park below lower St. Mary Lake near Babb, Montana, diverts water from the St. Mary River to the Milk River and eastern Montana for irrigation purposes in accordance with the Article VI of the Boundary Waters Treaty of 1909 with Canada, revised in 1921. Currently, there are no screens on the diversion structure to prevent native fish, including bull trout, from being entrained into the diversion system and permanently lost. In cooperation with the USFWS, Glacier National Park, the Blackfeet Tribe, and others, the BOR is developing a proposal for a number of modifications to protect native fish, including the possible installation of diversion screens and a fish ladder. Entrained fish would be diverted at the screens and returned to the St. Mary River through a return pipe, and the fish ladder would facilitate their return as adults to upstream spawning habitat. The BOR may also relocate and rebuild the dam further downstream. Eliminating the loss of bull trout and other native fish at the diversion structure would substantially benefit native fish populations in the St. Mary River drainage.
- *Projects Identified Under the GNP Commercial Services Plan.* The GNP *Final Commercial Services Plan* identified several actions for the Rising Sun area (NPS 2004). Most of these actions have not yet occurred, and all are dependent upon funding. They include the following:
    - Upgrade facilities and utilities to comply with life safety, accessibility and building codes.
    - Construct new accessible trails and walks.
    - Construct approximately ten two-unit cabins and associated parking on the upper loop.
    - Convert approximately three employee cabins to guest lodging.
    - Construct two new employee dormitories and associated parking near the Lower Motel that was converted to employee housing.
    - Construct an employee indoor recreation facility in the new employee dormitory and an outdoor recreation facility in the same general area.
    - Convert the Lower Motel to employee housing.
    - Convert the main Dormitory to guest lodging.
    - Relocate Boat Concessioner Housing to the area near the new dormitories.
    - Remove existing boat Concessioner Housing.
    - Convert the Power House Dormitory to storage.
    - Remove guest and employee housing from the General Store/Motel building.
    - Renovate the General Store/Motel building for public showers/restrooms, public laundry, guest registration and retail.
    - Reinforce, lengthen and raise the existing earth berm behind the General Store/Motel building.
    - Modify the intersection to the campground.
    - Increase restaurant capacity with an addition to the existing restaurant.

Table 3: Definitions for intensity levels and duration.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Fisheries/Aquatic Threatened Species and Species of Concern	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, herbivore-forage), 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.
Water Resources	Neither water quality nor hydrology would be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight and non-measurable.	Changes in water quality or hydrology would be measurable, although the changes would be small and the effects would be localized.	Changes in water quality or hydrology would be measurable and would be noticeable on a widespread scale.	Changes in water quality or hydrology would be readily measurable, would have substantial consequences and would be noticed on a regional scale.	Short-term – After implementation, recovery would take less than 1 year. Long-term – After implementation, recovery would take more than 1 year or effects would be permanent.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Floodplains	Floodplains 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 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 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 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.
Vegetation	Vegetation would not be affected or the changes would be so slight that they would not be of any measurable or perceptible consequence to the species' population.	Some individual native plants would be affected over a relatively small area, but the effects would be localized, and would be of little consequence to the species' population.	Some individual native plants would be affected over a relatively wide area or multiple sites and would be readily noticeable. A sizeable segment of a species' population could be affected.	Considerable long-term negative effects on native plant populations over a relatively large area of the park would occur. Extensive mitigation measures to offset the adverse effects would be required, and success of the mitigation measures would not be guaranteed.	Short-term: After implementation, would recover in less than 3 years. Long-term: After implementation, would take more than 3 years to recover or effects would be permanent.
Soils	Soil productivity or soil fertility would not be affected or the effect would be below or at the lower end of detection. Any effects to soil productivity or soil fertility would be slight and not measurable.	The effects to soil productivity or soil fertility would be detectable, but small. The area affected would be local.	The effect to soil productivity or soil fertility would be readily apparent. Effects would result in a change in soils over a relatively wide area or multiple locations.	The effect on soil productivity or soil fertility would be readily apparent and would substantially change the character of soils over a large area.	Short-term: After implementation, would recover in less than 3 years. Long-term: After implementation, would take more than 3 years to recover or effects would be permanent.

Impact Topic	Negligible	Minor	Moderate	Major	Duration
Historic Structures and Cultural Landscapes	Treatment is at the lowest levels of detection – barely perceptible and not measurable. For purposes of Section 106, the finding of effect would be no adverse effect.	Treatment would affect the character defining features of a National Register of Historic Places eligible or listed property, but is in accordance with the Secretary of the Interior's Standards. For purposes of Section 106, the finding of effect would be no adverse effect.	Treatment would alter a character defining features(s), diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register of Historic Places. For purposes of Section 106, the finding of effect would be adverse effect.	Treatment would alter a character defining feature(s) of a National Historic Landmark, diminishing the integrity of the resource to the extent that its designation is threatened. For purposes of Section 106, the finding of effect would be adverse effect.	Short-term: Effects extend only through the period of construction Long-term: Effects extend beyond the period of construction

Fisheries/Aquatic Threatened Species and Species of Concern

Affected Environment

Within the St. Mary River drainage located east of the Continental Divide, the native salmonid community includes bull trout (*Salvelinus confluentus*), lake trout(*Salvelinus namaycush*), mountain whitefish (*Prosopium williamsoni*), lake whitefish (*Coregonus clupeaformis*), and westslope cutthroat trout (*Oncorhynchus clarkii lewisi*); westslope cutthroat trout are listed by the state of Montana as a Species of Concern, and bull trout are federally listed as threatened under the Endangered Species Act and are also a state listed Species of Concern. Other native fish species in the St. Mary River drainage include trout perch (*Percopsis omiscomaycus*), northern pike (*Esox lucius*), burbot (*Lota lota*), longnose sucker (*Catostomus catostomus*), white sucker (*Catostomus commersoni*), spoonhead sculpin (*Cottus ricei*), and Rocky Mountain sculpin (*Cottus bondi*). Due to limited distributions in Montana (i.e. only found within Glacier National Park and the adjacent Blackfeet Indian Reservation), both the trout perch and spoonhead sculpin are state listed Species of Concern. Burbot are listed by the state as a Potential Species of Concern, which are "native taxa for which current often limited information suggests potential vulnerability" or for which "additional data are needed before an accurate status assessment can be made" (MNHP 2011).

Cutthroat trout, burbot, and bull trout have been captured in Rose Creek in the project area. Their seasonal habitat use of the stream is not well understood, but spawning and rearing has been observed for cutthroat trout, and juvenile and/or subadult burbot and bull trout have also been observed. This suggests Rose Creek may serve as seasonal feeding or rearing habitat for all three species.

Westslope cutthroat trout have evolved in the cold, low-productivity waters of the park. 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 ranging from 0.3 to 0.4 meters per second (Shepard et al. 1984). Migratory forms may spawn in the lower reaches of tributary streams used by resident fish. Slow water habitats (i.e. pools) are an important overwinter habitat feature for westslope cutthroat trout (Jakober et al. 1998). Genetic information is lacking for cutthroat trout in Rose Creek, but cutthroat trout captured downstream of the weir are morphologically similar to westslope cutthroat trout. Cutthroat trout have been observed spawning downstream of the weir, and have also been observed attempting to jump over the weir during the spawning period. Otokomi Lake, located in the headwaters of the Rose Creek drainage, supports a population of introduced Yellowstone cutthroat trout (Marnell et al. 1987). Some of these fish may migrate from Otokomi Lake to St. Mary Lake and then attempt to return to Otokomi Lake to spawn. It is therefore likely that Rose Creek below the weir supports a reproducing population of hybridized westslope and Yellowstone cutthroat trout.

Burbot are a freshwater member of the cod family with a circumpolar distribution. Previous sampling of St. Mary Lake documented specimens ranging in length from 368 to 890 millimeters in length. Burbot were the third most abundant species captured in gill nets in St. Mary Lake in 2008 (Downs and Stafford 2009), and juvenile burbot have been captured in lower Rose Creek in the summer.

Bull Trout. Bull trout exhibit three distinct life-history forms – resident, fluvial, and adfluvial. Resident bull trout spend their entire lives in small tributaries, whereas fluvial and adfluvial

forms hatch in small tributary streams then migrate into larger rivers (fluvial) or lakes (adfluvial). In the lakes of Glacier National Park, bull trout grow to maturity and then spawn either in tributaries or lake outlets. Migratory adult bull trout generally move upstream to spawning or staging areas from May through July, although some fish wait until the peak spawning time of September and October before entering spawning streams (Fraley and Shepard 1989; Schill et al. 1994; Downs and Jakubowski 2006). Resident and migratory forms may be found together, and either form can produce resident or migratory offspring. Spawning typically occurs in tributary streams between late August and early November (USFWS 1998), but more commonly in September and October (Block 1953; Fraley and Shepard 1989). Eggs over-winter in spawning streams until the following spring, when newly hatched fry emerge from the gravel. Young-of-the-year bull trout can often be found in side-channels and along channel margins following emergence (Fraley and Shepard 1989). Adfluvial juvenile bull trout typically migrate out of natal streams between the ages of 1 and 5; migration occurs in two pulses in some systems, one in the spring and another in late fall (Downs et al. 2006). Migrants less than 1 year of age have been reported in some adfluvial populations, but these individuals do not appear to survive well to adulthood (Downs et al. 2006).

Bull trout egg incubation success can be reduced by increasing levels of fine sediment (<6.35 millimeter diameter) in spawning nests, or redds (Montana Bull Trout Scientific Group 1998). Spawning site selection has been associated with areas of strong upwelling and downwelling (Baxter and Hauer 2000). Juvenile bull trout abundance has been positively correlated with low summer maximum water temperatures (below 14^0C) and with the number of pocket pools in stream reaches (Saffel and Scarnecchia 1995). A loose cobble substrate is an important overwinter habitat type for juvenile bull trout (Thurow 1997; Bonneau and Scarnecchia 1998). Excess fine sediment holds the potential not only to reduce egg and embryo survival, but might also limit juvenile bull trout abundance in streams by reducing the amount of interstitial spaces available for overwinter habitat. Channel stability, habitat complexity, and connectivity are all important components in bull trout population persistence (Rieman and McIntyre 1993).

Radio-telemetry and electrofishing data suggest the presence of both migratory and resident bull trout in the St. Mary River system (Mogen and Kaeding 2001). The dominance of the largely river-dwelling migratory form of bull trout in the St. Mary system suggests habitat partitioning with native lake trout, which are present in St. Mary Lake. Through evolutionary processes and life history differences, it is likely that bull trout came to dominate in the river and stream systems, while lake trout dominated in the lakes.

Lower St. Mary Lake and the lower St. Mary River in both the U.S. and Canada are key overwinter habitats for migratory bull trout using park waters for spawning and rearing (Mogen and Kaeding 2005). All identified spawning habitat for bull trout in the St. Mary River drainage exists within Glacier National Park, or within the larger Waterton-Glacier International Peace Park. Although juvenile bull trout rear in tributaries spanning both the park and the Blackfeet Indian Reservation, the primary juvenile rearing areas occur within the park. Stream access and the amount of physical stream habitat available for juvenile rearing in the St. Mary drainage is likely a primary limiting factor for bull trout, and is often limited by local geomorphology, such as hanging valleys with steep waterfalls.

Rose Creek is not Critical Habitat for bull trout, the drainage does not appear to support a reproducing population at this time, and use of Rose Creek by bull trout appears transient. Over approximately ten years of periodic sampling in lower Rose Creek, only one juvenile and one sub-adult-sized bull trout have been captured downstream of the weir.

IMPACT ANALYSIS

METHODOLOGY

Existing biological data for the species and the project area was reviewed. Experts in native species biology and ecology as well as experts in areas of stream restoration and engineering were consulted.

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, herbivore-forage), 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

Under the no action alternative, migratory westslope cutthroat trout and bull trout would continue to have access to only approximately 0.53 mile (855 meters) of stream habitat, from St. Mary Lake as far as the weir. This has been the case since the mid-1960's, when the weir was installed. Fish passage would likely continue to be seasonal and difficult at the Rose Creek Bridge due to the drop at the outlet of the bridge and shallow water depth underneath the bridge.

Westslope cutthroat trout would not occupy habitat upstream of the weir, and this would continue to have long-term adverse impacts on the species. These impacts would only be negligible to minor, however, as the barrier formed by the weir is not the primary factor limiting population expansion for westslope cutthroat trout. Hybridization with rainbow and Yellowstone cutthroat trout, highly dynamic stream networks, and limited access to tributary streams due to natural geologic features would continue to function as primary limiting factors for westslope cutthroat trout in the St. Mary drainage. Cutthroat trout of undetermined genetic status (presumed hybridized westslope-Yellowstone cutthroat trout) would continue to use the lower reaches of Rose Creek for spawning and rearing. Colonization of burbot in the upper reaches of Rose Creek would likely continue to be impeded by the barrier at the bridge, and certainly by the weir, due to the species' presumed poor jumping ability. But these impediments to burbot migration are not likely to measurably impact the overall burbot population in St. Mary Lake, and long-term adverse impacts to burbot would be negligible to minor. Bull trout

use of Rose Creek would continue to remain transient and spawning and rearing access would not be improved, resulting in minor long-term adverse impacts on bull trout.

Cumulative Impacts of Alternative A
Adverse impacts to native fish populations from long-term limited access to stream habitat under no action would increase incrementally when combined with small-scale, temporary disturbances to fish habitat at localized sites during rehabilitation of the GTSR and projects under the *Commercial Services Plan*.

Additionally, without fish passage improvements in lower Rose Creek, the potential benefits to bull trout from improvements at the BOR St. Mary diversion structure may not be fully realized. Currently, a substantial number of native fish likely representing a large proportion of the annual production of migratory bull trout are permanently lost into the BOR diversion system annually. In addition, returning adult bull trout have a considerable migration challenge in jumping upstream over the diversion dam to return to their natal streams. The likelihood of additional bull trout using Rose Creek would increase if improvements at the BOR diversion structure are implemented, but such an expansion would not be possible under the no action alternative.

Conclusion
Under the no action alternative, migratory westslope cutthroat trout and bull trout would continue to have access along lower Rose Creek as far as the weir, but fish passage would likely remain seasonal and challenging at the Rose Creek Bridge. While there would be long-term, local adverse impacts to westslope cutthroat trout, impacts would be negligible to minor since barriers to upstream fish passage are not the primary factor limiting population expansion. Burbot would not use the upper reaches of Rose Creek, but the overall population in St. Mary Lake would not be measurably affected; adverse impacts to burbot would be negligible to minor, long-term, and local. Spawning and rearing access would not be improved for bull trout, and the species would continue to use Rose Creek on a transient basis. Impacts to bull trout would be minor, long-term, adverse, and local. Cumulatively, there would be both short and long-term, negligible to minor, adverse, and site-specific impacts to fisheries from no action combined with GTSR rehabilitation and projects under the *Commercial Services Plan* due to temporary habitat disturbances; past and future improvements that reduce erosion and sedimentation for the long term would offset continued adverse impacts of no action. The fishery would not fully benefit from a potentially dramatic increase in the number of bull trout in the St. Mary drainage from anticipated modifications to the St. Mary diversion system, since physical habitat in Rose Creek would remain limited by man-made obstructions to fish passage.

Under Section 7, the no action alternative may affect, but is not likely to adversely affect bull trout.

IMPACT ANALYSIS OF ALTERNATIVE B - PREFERRED

Under the preferred alternative, natural habitat availability would be maximized in the Rose Creek drainage. Man-made obstructions that are no longer necessary would be removed and fish would have access to historically available habitat. While tributary habitat in Rose Creek would be relatively limited due to the hanging valley nature of the drainage, the project would more than double the amount of available habitat, providing another 0.57 mile of stream habitat in addition to the 0.53 mile currently available.

Rose Creek below the weir likely supports a reproducing population of hybridized westslope and Yellowstone cutthroat trout, and this would not be expected to change if the weir was removed. Although it is probable that cutthroat trout would occupy the currently inaccessible

habitat upstream of the weir, the cutthroat population would likely remain hybridized with limited opportunity for expansion. The project would therefore have no more than minor beneficial impacts to westslope cutthroat trout over the long term.

Burbot use of Rose Creek is not well understood, but they would likely benefit from the removal of the concrete sill between the piers of the existing Rose Creek Bridge. Burbot are thought to be poor jumpers, and the 2-3 foot-deep drop created by the concrete sill has likely prevented burbot from migrating upstream, especially during summer and fall when stream flows are lowest. Replacing the bridge with a clear span bridge would increase the potential for burbot to migrate upstream, but the benefit to the overall burbot population in St. Mary Lake is likely to be negligible to minor.

Physical habitat for bull trout would still be limited in Rose Creek due to the presence of natural upstream obstructions such as waterfalls. But the availability of additional stream habitat would increase the potential for use of Rose Creek by greater numbers of bull trout. If the newly accessible habitat were colonized by bull trout and a reproducing population became established, the project would have moderate long-term benefits to bull trout in the St. Mary drainage.

It is possible that non-native as well as native fish species would access the newly available habitat. Yellowstone cutthroat trout are already found in Otokomi Lake, upstream of the weir and the waterfalls. Brook trout have been captured in low numbers downstream of these barriers, and may also access newly available habitat. However, brook trout are found in low numbers in streams throughout the St. Mary drainage. Due to a number of possible factors such as low productivity, large substrate, unstable stream channels and high stream gradients, brook trout generally do not form robust populations in streams within the St. Mary River drainage. In addition, natural obstructions would continue to limit their access due to their small size, while larger adfluvial bull trout would be able to negotiate these areas and access the full extent of the newly available habitat. On balance, the project would afford more potential benefits for migratory bull trout than risks associated with movement of non-native fish species into the project area.

During weir removal and bridge demolition and construction, temporary turbidity and habitat disturbances would have negligible to minor adverse impacts to fisheries, including westslope cutthroat trout, burbot and bull trout. Implementing the project in September when stream flows are lowest would minimize negative impacts. Fracturing the weir with an expansive demolition grout is not likely to have any adverse effects on fisheries. The primary constituent of expansive grout is calcium hydroxide or calcium oxide (60-100%). Calcium hydroxide is formed when calcium oxide (lime) is mixed with water, and is used in a wide variety of applications including water treatment, food preparation, and even dentistry. Silica, ferric oxide, and aluminum oxide are also present in expansive grout products, but generally have a low hazard rating and low toxicity.

Cumulative Impacts of Alternative B

The analysis of cumulative impacts to fisheries evaluates anticipated activities within the Rose Creek drainage, roughly between the Golden Stairs (a rocky outcrop area along the GTSR approximately 900 meters west of the Rose Creek Bridge) and an intermittent stream approximately 800 meters east of the bridge. The preferred alternative would temporarily and incrementally increase the number of short term habitat disturbances to fisheries when combined with excavation and other activities associated with road rehabilitation and possible future developments under the *Commercial Services Plan*. But the limited area and short-term

nature of disturbance would reduce the likelihood of any measurable increase in adverse effects to fisheries. There would also be long-term beneficial cumulative impacts from increased access to stream habitat under Alternative B combined with drainage improvements during road rehabilitation that reduce erosion and sedimentation.

Long-term beneficial impacts to bull trout from the preferred alternative would increase with potential fish passage improvements at the BOR St. Mary diversion structure. Currently, what is likely a substantial proportion of the St. Mary drainage's annual production of migratory bull trout are permanently lost into the diversion system each year. In addition, adult bull trout attempting to return to their natal streams are faced with a considerable upstream migration challenge in jumping upstream over the diversion dam. If the adverse impacts presented by the BOR St. Mary diversion structure are successfully addressed, the likelihood of additional bull trout using Rose Creek would increase due to increased numbers of adult bull trout returning to spawn above the BOR St. Mary diversion structure.

Conclusion

Fracturing the weir with expansive demolition grout would likely have no adverse effects on fisheries. Turbidity and habitat disturbances during implementation of the preferred alternative would have short-term, site-specific, negligible to minor adverse impacts to fisheries, including bull trout. In the long term, however, the project would more than double the amount of currently available stream habitat, resulting in local beneficial impacts to fisheries. Long-term beneficial impacts to westslope cutthroat trout would be minor, since opportunities for westslope cutthroat trout populations to expand would remain limited by other factors. Long-term beneficial impacts to burbot would be negligible to minor, as the overall burbot population within St. Mary Lake would not be measurably affected. The increase in habitat availability under Alternative B would primarily benefit bull trout, providing an opportunity for bull trout to colonize areas upstream of the weir and establish a reproducing population, thereby conferring moderate beneficial impacts to the species for the long term.

Cumulatively, the preferred alternative combined with rehabilitation of the GTSR and future developments under the *Commercial Services Plan* would have site-specific impacts to fisheries that are negligible to minor, adverse, and short-term from temporary habitat disturbances, and minor to moderate, beneficial, and long-term from habitat restoration and improved sediment transport. If anticipated modifications to the BOR St. Mary diversion structure are realized, the potential increase in bull trout numbers returning above the dam combined with the increase in physical habitat availability in Rose Creek would have long-term, local, moderate beneficial impacts on bull trout.

Under Section 7, the preferred alternative may affect, but is not likely to adversely affect bull trout.

Water Resources

Affected Environment

The headwaters of the Rose Creek drainage originate in the Otokomi and Goat Lake basins in the St. Mary River drainage, on the east side of Glacier National Park. Most of the 5,090 acre (2,060 ha) Rose Creek drainage is in recommended wilderness, with the lower portion flowing adjacent to the Rising Sun developed area before passing beneath the Rose Creek Bridge along the GTSR. Water quality in the Rose Creek drainage is considered pristine. Streams typically originate in the headwaters of the drainage from snowmelt and snowmelt charged groundwater and springs. The landform composition of the drainage consists of the following types:

dissected mountain slope; moderately steep mountain slope; mountain upland and ridges; floodplain landforms; glacial lakes and deposits.

Arising from Otokomi Lake at an elevation of 6,482 foot (1,976 m) elevation, Rose Creek flows 5.5 miles (8.9 km) before entering St. Mary Lake near Rising Sun campground at an elevation of 4,484 feet (1,367 m). The creek flows in a southeasterly direction from its headwaters, cascading over waterfalls and through boulder and bedrock chutes before opening into a broad alluvial floodplain. Rose Creek is fairly unstable in this reach, with unstable banks eroding into alluvial terraces, and large volumes of stored coarse sediment. The total annual sediment load derived from streambanks in the alluvial terrace zone in the lower reaches of Rose Creek has been estimated at 101 cubic yards (River Design Group 2009). Flood and erosion control measures associated with local infrastructure developments have impacted Rose Creek within the project area, and the solid concrete sill spanning the width of the channel at the Rose Creek Bridge has altered sediment transport.

St. Mary Lake is the second largest lake in Glacier National Park with a surface area of 3,928 acres (1,590 ha) and an estimated water volume of 481,411 acre-feet. It has a maximum depth of 246 feet (75 m). The outlet of St. Mary Lake leaves the park and enters Lower St. Mary Lake on the Blackfeet Indian Reservation. From there water travels downstream into Canada, or into the BOR Milk River Irrigation Project where some of it is moved into the Milk River drainage for downstream irrigation in accordance with the 1909 Boundary Waters Treaty with Canada (revised 1921).

Rainfall, snowmelt and ground water discharge are the primary components of stream flows in the St. Mary River drainage. Snowmelt plays an important role during spring and early summer with the rise and fall of the runoff hydrograph. The majority of base flow that occurs in late summer, fall and winter is from the slow release of stored soil moisture. Groundwater also contributes sustained recharge to surface stream flows during late summer and fall through the release of groundwater stored in bedrock and unconsolidated surface layer materials which are hydrologically connected to Rose Creek and its tributaries.

Erosion potential is rated as moderate at the Rising Sun developed area, which is characterized by soils dominated by rocky and sandy alluvial grassland soils with small areas of flooded soils along Rose Creek (Dutton and Marrett 1997).

IMPACT ANALYSIS

METHODOLOGY

The methodology used to analyze potential impacts to water resources included standard stream survey methods, potential bank erosion estimation approaches, and empirically derived estimates of likely sediment release.

Negligible: Neither water quality nor hydrology would be affected, or the changes would be either non-detectable or if detected, would have effects that would be considered slight and non-measurable.

Minor: Changes in water quality or hydrology would be measurable, although the changes would be small and the effects would be localized.

Moderate: Changes in water quality or hydrology would be measurable and would be noticeable on a widespread scale.

Major: Changes in water quality or hydrology would be readily measurable, would have substantial consequences and would be noticed on a regional scale.

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

Long-term: After implementation, recovery would take more than one year or effects would be permanent.

IMPACT ANALYSIS OF ALTERNATIVE A – NO ACTION

Under the no action alternative, sediment scouring and stream channel degradation at the Rose Creek Bridge would remain unabated, and long-term adverse effects to hydrology in the immediate vicinity would continue. These adverse effects would be localized to the bridge site, however, and impacts would be negligible to minor.

Cumulative Impacts of Alternative A

The analysis of cumulative impacts to water resources evaluates anticipated activities within the Rose Creek drainage, roughly between the Golden Stairs (an area along the GTSR approximately 900 meters west of the Rose Creek Bridge) and an intermittent stream approximately 800 meters east of the bridge. Under no action, long-term adverse impacts to hydrology from sediment scouring and channel degradation would increase incrementally when combined with past and anticipated ground disturbances associated with road work and possible future developments at Rising Sun under the *Commercial Services Plan*, including an increase in hardened surfaces. Existing long-term adverse effects to hydrology and water resources under no action would be off-set to some degree by the long-term beneficial effects of culvert and drainage improvements during road rehabilitation and erosion reducing actions under the *Commercial Services Plan*.

Conclusion

The no action alternative would have negligible to minor, adverse, site-specific and long-term impacts to the hydrology at the Rose Creek Bridge due to unabated sediment scouring and stream channel degradation. Cumulatively, no action combined with ground disturbances and increased hardened surfaces associated with GTSR rehabilitation and developments at Rising Sun would have negligible to minor adverse, site-specific, long-term impacts to water resources, but these effects would be off-set by minor to moderate, site-specific, long-term beneficial impacts from drainage improvements and erosion reduction.

IMPACT ANALYSIS OF ALTERNATIVE B - PREFERRED

Fracturing the weir with an expansive demolition grout is not likely to have any adverse effects on water quality. The primary constituent of the product is calcium hydroxide or calcium oxide (60-100%). Calcium hydroxide is formed when calcium oxide (lime) is mixed with water, and is used in a wide variety of applications including water treatment, food preparation, and even dentistry. Silica, ferric oxide, and aluminum oxide are also present in expansive grout products, but generally have a low hazard rating and low toxicity.

Removal of the weir is expected to release approximately 83 cubic yards of sediment, which is less than the annual sediment yield from the raw, eroding stream banks located immediately downstream of the project reach (estimated at 101 cubic yards). Eighty-three cubic yards is likely a small fraction of the total sediment being produced in the watershed, and it is not expected that this volume of sediment would significantly alter the sediment transport characteristics or stability of Rose Creek (River Design Group 2009). The release of the stored sediment behind the weir coupled with limited use of heavy equipment in the stream would have minor to moderate short-term adverse impacts to water quality, partially due to the limited amount of stream channel downstream of the project area. The sediment would likely be

transported downstream and out of the project reach during subsequent spring high-water events.

Similarly, during replacement of the Rose Creek Bridge, removing the bridge's concrete floor would release sediment stored upstream. Some of the more coarse sediment may be stored within the project reach, but most would be mobilized and transported out of the project area the following spring as the channel adjusts its gradient. Some coarse sediment would be removed from the active stream channel after the concrete floor is removed in order to match the upstream and downstream channel gradients through the project reach. Some excavation below the ordinary high water mark would also be required for construction of the new bridge abutments and subsequent armoring with riprap (estimated at 210 cubic yards). However, this excavation would occur outside of the wetted channel and is not anticipated to impact water quality during construction.

Currently, sediment transport in Rose Creek is adversely impacted by the two piers that support the existing bridge. These piers reduce water velocity and thus reduce sediment transport capacity through the reach. Deposition of coarse sediment resulting in channel aggradation is evident immediately upstream of the bridge. Removal of the piers and replacement of the bridge with a clear-span structure would improve sediment transport capacity through the reach. The project would result in minor long-term benefits to water resources from improved sediment transport in the project area.

Cumulative Impacts of Alternative B

Cumulative impacts to water resources within the Rose Creek drainage have been assessed over an area roughly between the Golden Stairs (an area along the GTSR approximately 900 meters west of the Rose Creek Bridge) and an intermittent stream approximately 800 meters east of the bridge. Combined with previous and anticipated ground disturbances associated with road work and possible future developments at Rising Sun under the *Commercial Services Plan*, including an increase in hardened surfaces, the preferred alternative would incrementally increase site-specific, temporary sedimentation of water resources in Rose Creek. The short-term nature of the project and limited physical footprint would prevent any measurable long-term increase in adverse effects to water quality. Beneficial cumulative impacts would also accrue over the longer term from the restoration of natural sediment transport characteristics under Alternative B combined with culvert and drainage improvements during road rehabilitation and erosion reducing actions under the *Commercial Services Plan*.

Conclusion

Fracturing the weir with expansive demolition grout would likely have no adverse effects on water quality. A temporary release of sediments stored upstream of the weir and bridge, limited use of heavy equipment in the stream channel during both weir removal and bridge replacement, and recontouring of the stream bed at the bridge site would have minor to moderate short-term adverse impacts to water resources. These impacts would be site-specific to Rose Creek below the weir and near Rose Creek's inlet to St. Mary Lake. Removing the piers and replacing the bridge with a clear-span structure would have minor long-term, site-specific benefits to sediment transport in the project area. Cumulatively, temporary disturbances under Alternative B combined with GTSR rehabilitation and actions under the CSP would have negligible to moderate adverse, site-specific, short and long-term impacts to water resources; restoration of natural sediment transport characteristics of the stream channel would have minor to moderate beneficial, site-specific, and long-term impacts.

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 in the area.

Rose Creek flows in a southeasterly direction from its headwaters at Otokomi Lake in the St. Mary River drainage, cascading over waterfalls and through boulder and bedrock chutes before opening into a broad alluvial floodplain. Rose Creek is fairly unstable in this reach, with unstable banks eroding into alluvial terraces and large volumes of stored coarse sediment. The total annual sediment load derived from streambanks in the alluvial terrace zone in the lower reaches of Rose Creek has been estimated at 101 cubic yards (River Design Group 2009). Snowmelt, snowmelt charged groundwater, rainfall, and springs are the primary components of the stream flow in the drainage, and water quality would be described as pristine. Rose Creek experiences appropriate peak and base flows, similar to an undisturbed watershed of similar size in a similar geology and geography. Downstream of the project site, erosion/instability is evident where the stream channel cuts into adjacent terraces. Some of this is related to disturbance caused by attempts to reduce flood risk and keep the stream flowing under the existing bridges, but some degree of instability would be natural as the stream cuts through unconsolidated alluvial and glacial till. Some riprap has been placed to stabilize lateral movements of the channel. Upstream of the Rising Sun developed area, Rose Creek has appropriate access to its floodplain. At Rising Sun and downstream of the developed area, the creek is incised (or has cut downward below the elevation where it can readily access its floodplain) and flood and erosion control measures have also limited the creek's ability to access its floodplain or create a new floodplain at a lower base level.

Impact Analysis

Methodology

The methodology used to analyze the potential impacts on floodplains is an analysis of expected changes to floodplains under both alternatives. Changes in flood flow capacity and the stream's accessibility to its floodplain are assessed.

Negligible: Floodplains 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 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 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 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 Analysis of Alternative A – No Action

Under no action, current conditions would not change and lower Rose Creek would still have limited access to its floodplain. The concrete sill and piers at the Rose Creek Bridge would continue to obstruct flood flows, and the ongoing deposition of sediments upstream of the bridge would continue to hinder the stream's ability to establish a stable channel and associated floodplain. Due to the already incised condition of the floodplain, however, further impacts to floodplains under no action would only be negligible to minor; impacts would be slightly greater in the case of a substantial flood event.

Cumulative Impacts of Alternative A

The floodplain along lower Rose Creek is already adversely impacted for the long-term from ongoing channel incision and flood and erosion control measures at adjacent developed areas. Under no action, ongoing adverse impacts to floodplains would continue.

Conclusion

Lower Rose Creek would continue to have limited access to its floodplain under the no action alternative, since flood flows would continue to be obstructed by the concrete sill and piers at the Rose Creek Bridge. Impacts to floodplains would be negligible to minor, adverse, site-specific and long-term. Cumulatively, continued impacts to floodplains under Alternative A combined with ongoing channel incision and flood and erosion control measures at adjacent developed areas would be negligible to moderate, adverse, long-term, site-specific and local.

Impact Analysis of Alternative B - Preferred

The removal of the existing bridge's concrete sill and piers and the removal of the weir just upstream of Rising Sun would eliminate some restrictions to flood flows along lower rose Creek and improve flood flow capacity, resulting in a negligible to minor, long-term benefit to floodplains. There would be some negligible adverse impacts to floodplains over the long term since the abutments for the new bridge would occupy the floodplain and displace some water during high water periods, impacting the way flood flows use the floodplain over a very short distance of the stream. Some temporary disturbances to floodplain soils would occur during project implementation, but these impacts would be localized and remediated by spring flows.

Cumulative Impacts of Alternative B

Replacing the Rose Creek Bridge with a clear span bridge would modify the existing condition of the floodplain by incrementally reducing adverse impacts from ongoing channel incision and flood and erosion control measures at adjacent developed areas.

Conclusion

The removal of the existing Rose Creek Bridge's concrete sill and piers and the removal of the weir just upstream of Rising Sun would remove some restrictions to flood flows along lower Rose Creek and improve flood flow capacity, resulting in negligible to minor, site-specific, and long-term beneficial impacts to the floodplain. The abutments for the new bridge would occupy the floodplain and displace some water during flood flows over a very short distance of the stream, causing negligible adverse, site-specific, and long-term impacts to floodplains. Localized disturbances to floodplain soils during project implementation would be remediated by spring flows, and would have site-specific, short-term, negligible adverse impacts to floodplains. Cumulatively, the preferred alternative would incrementally reduce existing adverse impacts to floodplains from ongoing channel incision and flood and erosion control measures at adjacent developed areas, and cumulative impacts to floodplains would be negligible to moderate, adverse and beneficial, short and long-term, site-specific and local. An SOF describing the impacts to floodplains that could occur is attached.

Vegetation

Affected Environment

Most of lower Rose Creek is an unvegetated waterway. The width of the high water mark ranges between 15 and 35 feet within the creek banks. A narrow strip of overstory vegetation at the outer edges of the high water mark is dominated by black cottonwood (*Populus balsamifera*) at 10 to 50% cover and a small amount of Engelmann spruce (*Picea engelmannii*) at 2-3% cover; Douglas fir (*Pseudotsuga menziesii*) is also present in the overstory.

Understory vegetation at the edges of the creek has moderate cover (5 to 20%) of shrubs. Shrub species include redosier dogwood (*Cornus sericea*), mountain alder (*Alnus incana*), Drummond willow (*Salix drummondii*), and thimbleberry (*Rubus parviflorus*). Native understory herbaceous cover ranges from 10 to 25%. Dominant plants include forbs white angelica (*Angelica arguta*), leafy aster (*Symphyotrichum foliaceum*), smooth aster (*Symphyotrichum laeve*), and cow parsnip (*Heracleum sphondylium*) in addition to grasses bluejoint reedgrass (*Calamagrostis canadensis*) and slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*). Other species that are present with low cover (1%) include arrowleaf groundsel (*Senecio triangularis*), fireweed (*Chamerion angustifolium*), hairy arnica (*Arnica mollis*), fringed grass-of-parnassus (*Parnassia fimbriata*), stinging nettle (*Urtica dioica*), scouring rush (*Equisetum hyemale*), tufted hairgrass (*Deschampsia cespitosa*), golden sedge (*Carex aurea*), and Drummond's rush *(Juncus drummondii*).

Non-native plants, including invasive species, are also present within the creek bed and on the banks of the creek. Near the weir, state listed noxious weeds spotted knapweed (*Centaurea maculosa*) and houndstongue (*Cynoglossum officinale*) are present with low cover. Near the bridge and GTSR, more weed species are present with low cover including cheatgrass (*Bromus tectorum*), quackgrass (*Elytrigia repens*), smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*Poa compressa*), yellow sweetclover (*Melilotus officinalis*), mullein (*Verbascum thapsus*), and spotted knapweed.

A riparian zone exists adjacent to the creek that averages 10 to 20 feet on either side of the creek banks. Vegetation similar to that described above exists in the riparian zone along with several other upland plant species. No rare plants or rare plant habitats are known to be located in the vicinity of the project area.

In 1992-1994, vegetation was restored on 2.0 acres within the Rising Sun developed area and on 0.64 acres along Rose Creek as part of the mitigation for construction activity along the GTSR and a redesign of the Rising Sun parking lot between the camp store and the restaurant. In 1995, a severe flood event washed over all newly restored soils and vegetation. Some vegetation was restored on the floodplain above Rose Creek between the parking lot and the road following the flood.

Impact Analysis

Methodology

The methodology used to analyze the potential impacts on vegetation is an analysis of expected changes to the vegetation under both alternatives. Changes in surface disturbance and vegetation productivity are assessed. The affected environment for vegetation is limited to areas adjacent to the stream bank along lower Rose Creek.

Negligible: Vegetation would not be affected or the changes would be so slight that they would not be of any measurable or perceptible consequence to the species' population.

Minor: Some individual native plants would be affected over a relatively small area, but the effects would be localized, and would be of little consequence to the species' population.

Moderate: Some individual native plants would be affected over a relatively wide area or multiple sites and would be readily noticeable. A sizeable segment of a species' population could be affected.

Major: Considerable long-term negative effects on native plant populations over a relatively large area of the park would occur. Extensive mitigation measures to offset the adverse effects would be required, and success of the mitigation measures would not be guaranteed.

Short-term: After implementation, would recover in less than 3 years.

Long-term: After implementation, would take more than 3 years to recover or effects would be permanent.

IMPACT ANALYSIS OF ALTERNATIVE A – NO ACTION

Because there would be no action, there would be no impacts to vegetation under Alternative A.

Cumulative Impacts of Alternative A

Because there would be no action, there would be no cumulative impacts from past, ongoing, or reasonably foreseeable actions combined with this alternative.

Conclusion

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

IMPACT ANALYSIS OF ALTERNATIVE B - PREFERRED

During weir removal, a localized area of less than one acre of understory vegetation adjacent to the stream bank would be disturbed and compacted by the temporary stockpiling of demolished concrete and rebar, causing minor, short-term adverse impacts to vegetation. Although stream bank vegetation at the bridge site is sparse, some individual plants would likely be lost during demolition and construction of bridge abutments. But the effects would be localized to the bridge site, few plants would be affected overall, and impacts to vegetation would be minor.

Cumulative Impacts of Alternative B

Vegetation in the vicinity of the Rose Creek shoreline through the Rising Sun developed area has been previously disturbed and reclaimed, most recently with the redesign of the parking lot and construction activities along the GTSR in 1992-1994; vegetation was restored, but a severe flood in 1995 washed over all newly restored vegetation. Past construction activity has also resulted in an increase in non-native invasive plant species. Through careful restoration and mitigation, adverse impacts to vegetation have been kept to a minor level. Adverse impacts to vegetation would increase incrementally from the preferred alternative combined with disturbances to vegetation from GTSR rehabilitation and possible future developments at Rising Sun under the *Commercial Services Plan*.

Conclusion

Impacts to vegetation under Alternative B would be minor, adverse, site-specific, and short-term as a result of understory disturbance and compaction, and the loss of some individual plants adjacent to the stream bank. Cumulatively, impacts to vegetation from Alternative B combined with past, present and future actions would be minor, adverse, site-specific, short-term and long-term due to ground disturbance and vegetation removal.

Soils

Affected Environment

The soils along Rose Creek through the Rising Sun developed area are classified as clay-rich conifer and clay-rich aspen forest soils located on lateral glacial moraines and landslides along the upper reaches of the creek, and as alluvial grassland soils on alluvial fans, high stream terraces and glacial outwash terraces for the Rising Sun developed area nearer the GTSR (Dutton and Marrett 1997).

The parent material for the clay-rich conifer and aspen forest soils is mainly glacial drift and/or landslide deposits with clay loam or silty clay loam textures; surface materials are volcanic ash-rich wind deposits with silt loam or loam textures (Dutton and Marrett 1997). Rock fragments are unsorted and semi-rounded; quartzite and argillite are dominant rock types with some limestone and occasional fragments of shale and sandstone (Dutton and Marrett 1997). The area is a complex of two main soils although it contains others in smaller amounts, and the forest soils are deep and well-drained and are composed of a silt loam/loam surface layer with 0 – 15% rock content (Dutton and Marrett 1997). Subsoil is gravelly/very gravelly clay loam or silty clay loam with 35 – 60% rock; because of the high silt and clay content, available water holding capacity is high (Dutton and Marrett 1997). The conifer forest soil is classified as a loamy-skeletal, mixed Typic Cryoboralf and the aspen forest soil is classified as Argiaquic Cryoborolls (Dutton and Marrett 1997). The high silt and clay content of these soils results in high moisture and nutrient holding capacity, which results in high productivity and revegetation potentials (Dutton and Marrett 1997). The silty textures, periodic wet conditions and low surface rock content result in low ratings for road and trail construction, and trail erosion is common through these soils where the surface vegetation and plant litter is removed (Dutton and Marrett 1997). These soils have a high erosion potential when disturbed due to the loamy surface soil texture and limited rocks, and have moderate susceptibility to weed infestation when disturbed (Dutton and Marrett 1997).

The alluvial soils were formed in deposits left by streams, and were either recently deposited by existing streams or deposited by glacial outwash streams at the end of the last ice age (Dutton and Marrett 1997). Common characteristics of these soils are their coarse textures, rapid permeability and low water/nutrient holding capacities (Dutton and Marrett 1997). The area's deep, well-drained grassland alluvial soils are dominated by loam or sandy loam textures and abundant, well-rounded gravels and cobbles with moderate available water holding capacity, and are classified as loamy-skeletal, mixed Typic Haplocryolls (Dutton and Marrett 1997). Productivity and revegetation potential are moderate to high overall, but decrease in the subsoil due to higher rock content and lower water and nutrient holding capacity; organic matter, microbial activity and available nutrient levels also decrease rapidly with depth (Dutton and Marrett 1997). High subsoil rock content and good drainage results in soil that is well suited to road and trail construction, but there is high susceptibility to weed infestation when this soil is disturbed (Dutton and Marrett 1997). This soil has moderate erosion potential and erosion will occur whenever the surface vegetation and plant litter is removed (Dutton and Marrett 1997).

Impact Analysis

Methodology

The methodology used to analyze the potential impacts to soils is an analysis of expected changes to soils under both alternatives. The affected environment for soils is limited to areas adjacent to the stream bank along lower Rose Creek.

Negligible: Soil productivity or soil fertility would not be affected or the effect would be below or at the lower end of detection. Any effects to soil productivity or soil fertility would be slight and not measurable.

Minor: The effects to soil productivity or soil fertility would be detectable, but small. The area affected would be local.

Moderate: The effect to soil productivity or soil fertility would be readily apparent. Effects would result in a change in soils over a relatively wide area or multiple locations.

Major: The effect on soil productivity or soil fertility would be readily apparent and would substantially change the character of soils over a large area.

Short-term: After implementation, would recover in less than 3 years.

Long-term: After implementation, would take more than 3 years to recover or effects would be permanent.

IMPACT ANALYSIS OF ALTERNATIVE A – NO ACTION

Under no action, sediment transport in lower Rose Creek would remain inhibited at the Rose Creek Bridge. Substrate at the site would therefore continue to aggrade, further decreasing channel competence and capacity and pushing erosive forces (increased sheer stress) into the stream banks upstream of the bridge. This would result in a continued widening of the channel and soil erosion along the outer edges of the stream bank. Downstream erosion would continue because of upstream channel constrictions and resultant increases in water velocities moving through the bridge. These effects have already been occurring for several years, however, and sediment aggradation, water velocities, and channel widening have likely come close to reaching equilibrium. Additional impacts to soils would occur under no action, but they would be negligible to minor; impacts could be greater during a flood event. There would be no impacts to soils at the weir site under Alternative A.

Cumulative Impacts of Alternative A

Soils surrounding the Rose Creek project area and the Rising Sun developed area have been disturbed a number of times over the years, most recently with construction activities related to redesign of the parking lot between the camp store and the restaurant and GTSR rehabilitation in 1992-1994. Soils were restored, but a severe flood in 1995 washed over all newly restored soils. Under the no action alternative, adverse impacts to soils would continue to increase incrementally combined with GTSR rehabilitation and possible future developments at Rising Sun called for in the *Commercial Services Plan*.

Conclusion

A continued loss of stream channel competence and capacity under Alternative A would result in ongoing sediment aggradation, channel widening, and erosion of soils at the outer edges of the stream channel both upstream and downstream of the bridge. The channel has already undergone these impacts for several years and has likely reached equilibrium; additional impacts would therefore be negligible to minor, adverse, long-term, and site-specific. Cumulatively, no action would incrementally increase adverse impacts to soils from other actions, causing negligible to minor, adverse, site-specific and long-term impacts. There would be no impacts to soils at the weir site under Alternative A.

IMPACT ANALYSIS OF ALTERNATIVE B - PREFERRED

Under the preferred alternative, soil productivity would be degraded and the natural state of soils would be altered within the immediate footprint of any non-road surfaces driven on during

removal of the weir. This would also be true of construction activity required to replace the bridge, both during the removal and construction of abutments. Soils surrounding the work sites and access points would be compacted and top soil would be degraded or disturbed; impacts would be limited to the immediate vicinity of the work sites, and adverse impacts to soils would be minor and short-term. Soils at the bridge site would benefit for the long-term from improved sediment transport and a resulting decrease in sediment aggradation, channel widening, and stream bank erosion.

Cumulative Impacts of Alternative B
Soils surrounding the Rose Creek project area and the Rising Sun developed area have been disturbed a number of times over the years, most recently with construction activities related to redesign of the parking lot between the camp store and the restaurant and GTSR rehabilitation in 1992-1994. Soils were restored, but a severe flood in 1995 washed over all newly restored soils. Adverse impacts to soils would increase incrementally under Alternative B when combined with GTSR rehabilitation and possible future developments at Rising Sun under the *Commercial Services Plan*.

Conclusion
Under the preferred alternative, impacts to soils would be minor, adverse, site-specific, and short-term from degradation, compaction, and disturbance within the immediate vicinity of the work sites. Minor beneficial, site-specific, and long-term impacts to soils would occur from improved sediment transport and reduced stream bank erosion. Cumulative impacts to soils from the preferred alternative and past, ongoing, and reasonably foreseeable actions would be minor, adverse, site-specific and short and long-term from an incremental increase in disturbance and degradation.

Cultural Resources

Historic Structures and Cultural Landscapes

Affected Environment

Glacier National Park is steward of a wide array of significant cultural resources. The National Historic Preservation Act (NHPA) defines five historic property types: districts, sites, buildings, structures, and objects. The National Environmental Policy Act uses the term cultural resources and defines them as archeological resources, cultural landscapes, historic structures, ethnographic resources, and museum objects. As of 2011, 356 archeological sites, 371 historic buildings and structures, and one cultural landscape have been documented within the park. Most of the buildings and structures are listed in the National Register of Historic Places. Six buildings and the one documented cultural landscape, the Going-to-the-Sun Road, also are designated National Historic Landmarks. The park has prepared an ethnographic overview documenting the importance of many landscapes and features to the Blackfeet, Salish, and Kootenai tribes (Reeves and Peacock 2001).

The weir and Rose Creek Bridge were determined not to be eligible for listing in the National Register of Historic Places and therefore are not historic. However, the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations (36 CFR § 800) require federal agencies, such as the NPS, to identify potentially significant historic properties (cultural resources) within the area of potential effect (APE) of an agency's proposed undertaking and to consider the effects of the undertaking on cultural resources before taking any action. The APE includes the geographic area within which an undertaking might directly or indirectly cause alterations in the character or use of a cultural resource. The NHPA and its implementing regulations require that the NPS consult with the State Historic Preservation

Office (SHPO), Tribal Historic Preservation Offices (THPO), and other interested parties to identify cultural resources within the APE, assess the undertaking's effects, and seek ways to avoid, minimize, or mitigate any adverse effects on cultural resources.

Going-to-the-Sun Road. The historic significance of the Going-to-the-Sun Road has been well recognized by the federal government and others. The Road was listed in the National Register of Historic Places in 1983, it was designated a National Historic Civil Engineering Landmark in 1985, it was documented by the Historic American Engineering Record (HAER) in 1990, and it was designated a National Historic Landmark by the Secretary of the Interior in 1997. The latter distinction is the most noteworthy and restrictive, and affords the Road and its component features the highest possible level of federal protection. The Road is considered significant for its history, its landscape design, and its engineering. As an early example of a major national park roadway, the Road represents a pioneering federal attempt to design and construct an automobile road that both harmonized with its environment and showcased its natural surroundings. These design philosophies, as embodied in the Road, became a model for future parkway projects to follow. The engineering and landscape architecture techniques used in the Road further reflected this design philosophy, featuring well-crafted stonework and gently curving walls that blended perfectly with the spectacular natural setting. Both the National Register and National Historic Landmark nominations include the length of the road from the foot of Lake McDonald to park boundary at St. Mary. Important individual structures that are part of the road - primarily bridges and tunnels - are listed as contributing to the Road's significance. The Rose Creek Bridge is not one of those structures. The bridge, built in 1932, was heavily damaged by flooding in 1964 and reconstructed to its present appearance the same year. The Montana State Historic Preservation Office concurred in the park's determination that the bridge does not meet the criteria for listing in the National Register of Historic Places.

Rose (Roes) Creek Campground Camptender's Cabin. The Rose (Roes) Creek Campground Camptender's Cabin is located just west of Rose Creek and just north of the Going-to-the-Sun Road at the entrance to the Rising Sun Campground. Visitor services development began in the Rising Sun area along Going-to-the-Sun Road in the earlier 1930s with construction of the Rising Sun Campground. The increase in auto camping at Glacier National Park during the 1920s and 1930s encouraged the NPS to spend more money and effort toward the improvement of park campgrounds. Early camping sites, haphazardly developed, were superseded by newly designed major campgrounds at sites such as the one at Rose Creek (Rising Sun). In addition to basic camping services, an increased NPS presence was also warranted: campgrounds were assigned seasonal "camptenders" who performed custodial duties and provided assistance to visitors. Plans for the log camptender's cabin at Rose Creek Campground (now Rising Sun Campground) were completed in May, 1935, although the building itself was apparently not finished until September 29, 1937. Work was performed by members of Glacier's CCC camp GNP-11, located a few hundred yards from the building site. Cost of the building was approximately $1,380. The building was listed in the National Register of Historic Places in 1996.

Rising Sun Auto Camp Historic District. The Rising Sun Auto Camp Historic District is located just east of Rose Creek and just north of the Going-to-the-Sun Road. The facilities were constructed by the Glacier Park Hotel Company in 1940-41 in response to the increasing number of auto tourists who wanted more modest, less expensive accommodations and reasonably priced meals. The district is composed of a general store/coffee shop, 19 cabins, two dormitories and other support buildings. The district was listed in the National Register of Historic Places in 1996. The weir on Rose Creek was constructed after a major flood in 1964 washed out the Auto Camp's existing system. The Montana State Historic Preservation Office concurred with the park's

determination that the weir does not meet the criteria for listing in the National Register of Historic Places.

CULTURAL LANDSCAPES

The NPS defines a cultural landscape as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein associated with a historic event, activity, or person, or that exhibits other cultural or aesthetic values" (NPS 1998). The Going-to-the-Sun Road is a designated National Historic Landmark. Two of the criteria establishing the road's significance are associated with cultural landscape characteristics: its association with the American Park movement and its exceptional value as an example of American landscape architecture (Begley 1996). The Going-to-the-Sun Road Cultural Landscape Report (RTI 2002) documented the following key cultural landscape characteristics of this section of the road from Rose Creek to St. Mary:

Roadway Qualities and Features

- Standard (22-foot) roadway width, with straightaways and few broad curves
- Some gentle grades, but largely level overall
- Bridges across St. Mary River and Divide Creek are the only major contributing structures
- Most of the segment was rehabilitated in 1991-93

Cultural Resource Qualities and Features

- Segment largely reflects design and construction activities from the early 1930s
- The stone bridge across the St. Mary River is a key historic feature along the Road; the Divide Creek Bridge is also historic
- The St. Mary Visitor Center is representative of NPS Mission 66 architecture
- Segment is part of the Sun Road National Register of Historic Places and National Historic Landmark nominations

Visual/Experiential Qualities and Features

- The segment features medium and long-range views of St. Mary Lake and the mountains beyond
- Shorter views emphasize the hilly grasslands surrounding the Road

IMPACT ANALYSIS

METHODOLOGY

In this environmental assessment (EA), impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implement the National Environmental Policy Act (NEPA). These impact analyses are not intended, however, to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA). The Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), require a level of documentation for findings of effect sufficient to understand its basis, i.e. design development drawings for rehabilitation projects, which are not available at this time. The park is coordinating compliance with Section 106 and the steps taken to meet the requirements of this EA. This coordination includes public participation, State Historic Preservation Office and Tribal Historic Preservation office consultation, and the identification of historic properties requirements. Findings of effect, however, would be made independently of the NEPA process. A preliminary Section 106 finding of effect is included in

the impact analysis sections under the preferred alternative for cultural resource topics.

The preliminary finding of effect was made in accordance with the Advisory Council on Historic Preservation's regulations. Effects to historic properties were identified and evaluated by (1) determining the area of potential effect(s); (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible for listing in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected National Register resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register (e.g. diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that would occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

CEQ regulations and the National Park Service's Conservation Planning, Environmental Impact Analysis and Decision-making (Director's Order 12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g. reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

Impact intensity levels for this analysis are defined as:

Negligible: Treatment is at the lowest levels of detection – barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor: Treatment would affect the character defining features of a National Register of Historic Places eligible or listed property, but is in accordance with the Secretary of the Interior's Standards. For purposes of Section 106, the finding of effect would be no adverse effect.

Moderate: Treatment would alter a character defining feature(s), diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register of Historic Places. For purposes of Section 106, the finding of effect would be adverse effect.

Major: Treatment would alter a character defining feature(s) of a National Historic Landmark, diminishing the integrity of the resource to the extent that its designation is threatened. For purposes of Section 106, the determination of effect would be adverse effect.

Short-term: Effects extended only through the period of construction.

Long-term: Effects extended beyond the period of construction.

IMPACTS OF ALTERNATIVE A – NO ACTION

Alternative A would result in no changes to current operations and no construction of new facilities or alteration of existing facilities. This alternative would have no impact on the National Historic Landmark Going-to-the-Sun Road, the National Register-listed Rose Creek Campground Camptender's Campground or Rising Sun Auto Camp Historic District. Section 106: For purposes of Section 106, the no action alternative would not meet the definition of an undertaking; therefore, Section 106 review would not be required.

Cumulative Impacts of Alternative A

Alternative A would not contribute to impacts from past, ongoing, and future actions as no new activities that affect historic structures and cultural landscapes would occur.

Conclusion

There would be no impacts to historic structures or cultural landscapes under the no action alternative. Alternative A would also not contribute to the impacts of past, ongoing, or reasonably foreseeable actions.

IMPACT ANALYSIS OF ALTERNATIVE B – PREFERRED

Under Alternative B, removal of the weir on Rose Creek would have no impact on historic structures and cultural landscapes. The structure is physically and visually removed from the identified resources. Replacing the Rose Creek Bridge would directly benefit the GTSR and have beneficial visual effects on the Rose Creek Auto Camp Historic District and the Rising Sun Campground Camptender's Cabin, since the appearance of the new bridge would be more compatible with the historic design characteristics of these historic properties. The new bridge would be designed to meet The Secretary of the Interior's Standards for the Treatment of Historic Properties. The proposed project would not diminish the character defining features of any of the listed structures. For purposes of Section 106, the finding of effect would be no adverse effect.

Cumulative Impacts of Alternative B

Of the projects identified for consideration of cumulative impacts, the Going-to-the-Sun Road Rehabilitation Project and the St. Mary Falls Trailhead Parking upgrade would have detectable impacts on the Rose Creek Auto Camp Historic District, the Rising Sun Campground Camptender's Cabin, and the Going-to-the-Sun Road and its cultural landscape. The *Going-to-the-Sun Road Rehabilitation Plan/Final Environmental Impact Statement* (EIS) identified the preferred rehabilitation alternative as having negligible to moderate short-term adverse and long-term beneficial impacts to cultural resources (NPS 2003). The EIS recognized the potential for adverse impacts to the road and its cultural landscape resulting from the rehabilitation and the construction of visitor use improvements at several locations within the road corridor. All work is being undertaken in conformance with the Secretary's Standards in order to minimize and mitigate potential adverse impacts.

Conclusion

Removing the weir would have no impact on historic structures and cultural landscapes. Replacing the bridge would have minor beneficial, long-term, site-specific and local impacts to the Rose Creek Auto Camp Historic District, the Rising Sun Campground Camptender's Cabin, and the GTSR since the appearance of the new bridge would be more compatible with the historic design characteristics of these historic properties. Cumulatively, the minor beneficial impact of the proposed bridge removal and reconstruction would add an incremental degree of impact to the overall negligible to moderate, short term adverse and long-term beneficial, impacts on historic structures and cultural landscapes.

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 regulations of 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 not likely to adversely affect**" **bull trout**; the NPS has determined **"no effect" to grizzly bears and Canada lynx.** In accordance with Section 7, the NPS has initiated informal consultation with the USFWS and submitted a fisheries biological assessment.

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. The Montana State Historic Preservation Office has concurred with the park's determination that neither the weir on Rose Creek nor the Rose Creek Bridge meet the criteria for listing in the National Register of Historic Places.

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 consistent with the Clean Water Act. The US Environmental Protection Agency (EPA) also has responsibility for oversight and review of permits and actions which affect waters of the United States. On July 19, 2011, park staff met with a representative from the Army Corps of Engineers (COE) onsite to discuss the proposed project. Permits for the proposed work will be obtained; a letter dated August 4, 2011 from the Army Corps of Engineers stated that the project may qualify for a Nationwide Permit 27.

Executive Order 11990, Protection of Wetlands – E.O. 11990 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…". The project area was surveyed for wetlands, and no evidence of wetland hydrology was observed. Therefore, according to the defining criteria for wetlands under the 1987 Corps of Engineers Wetlands Delineation Manual, there are no wetlands in the project area.

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 NPS has determined that adverse impacts to floodplains from the proposed actions would be negligible. An SOF describing the negligible adverse impacts to floodplains that could occur from this project is attached.

CONSULTATION/COORDINATION

PREPARERS

Chris Downs, Fisheries Biologist – Project Lead, Fisheries/Aquatic T & E sections, biological assessment; water resources; project description and alternatives
Lon Johnson, Cultural Resource Specialist – Cultural resource sections, SHPO consultation
Joyce Lapp, Restoration Biologist – Vegetation and soils sections
Mary Riddle, Environmental Protection Specialist, Team Captain – Project Lead, NEPA compliance, quality review, and editing; project description and alternatives; agency consultation
Amy Secrest, Compliance Biological Science Technician – Assisted with preparation of the entire EA, particularly the wildlife, T & E species, and natural soundscape sections; document compilation, technical writing, editing, and formatting
John Waller, Wildlife Biologist – Wildlife, Threatened and Endangered Species and Species of Concern sections

CONSULTANTS

Danny Capri, Environmental Protection Specialist, Federal Highway Administration
Jack L. Gordon, Landscape Architect, Glacier National Park
Wesley A. Reynolds, P.E., Park Engineer, Glacier National Park
Michael Traffalis, Project Manager, Federal Highway Administration

AGENCIES/ TRIBES/ ORGANIZATIONS/ INDIVIDUALS CONTACTED (EA RECIPIENTS)

Federal and International

Advisory Council on Historic Preservation
Max Baucus, United States Senate
Jon Tester, United States Senate
Dennis Rehberg, United States House of Representatives
Flathead National Forest (Kalispell, Hungry Horse)
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service (Helena and Creston)
U.S. Geological Survey, Biological Resources Division
U.S. Department of the Interior, Office of the Solicitor
U.S. Department of the Interior, NPS Intermountain Regional Director
Waterton Lakes National Park, Canada
Premier of the Province of Alberta, Honorable Alison Redford

State

Environmental Quality Council, Director, Helena
Federal Documents Librarian
Flathead Basin Commission
Montana Department of Environmental Quality, Board of Environmental Review
Montana Department of Environmental Quality Permitting & Compliance, Helena
Montana Department of Environmental Quality, Water Protection Bureau
Montana Department of Environmental Quality, Air Quality Division
Montana Department of Natural Resources and Conservation

Montana Fish, Wildlife, and Parks, Region One Supervisor, Kalispell
Montana State Historic Preservation Office
Brian Schweitzer, Governor of Montana
Stillwater State Forest

Tribes

T.J. Show, Chair, Blackfeet Tribal Business Council w/copies to Tribal Council and the Blackfeet Tribal Historic Preservation Office
E.T. Moran, Chair, Confederated Salish and Kootenai Tribes of the Flathead Reservation w/copies to Tribal Council and Confederated Salish and Kootenai Tribal Historic Preservation Department

County and City

Flathead County Commissioners
Flathead County Planning and Zoning Board
Glacier County Commissioners
Mayors and City Councils of Browning, Kalispell, Columbia Falls, and Whitefish, MT

Groups/Businesses

Backcountry Horsemen
Friends of the Wild Swan
Glacier National Park Fund
Glacier Association
Glacier National Park Associates
Glacier Park Boat Co.
Glacier Park Magazine
Glacier Park, Inc.
Glacier Raft Company
Glacier Waterton NP Visitor Association
Great Northern Whitewater Resort
Montana Preservation Alliance
Montana Raft Company
Montana Wilderness Association
National Parks Conservation Association
National Trust for Historic Preservation, Mountain/Plains Office
West Glacier Mercantile
Wilderness Watch
Wild River Adventures

Individuals

A complete list is available upon request

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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.

APPENDIX A
PRELIMINARY BRIDGE CONCEPT DESIGNS

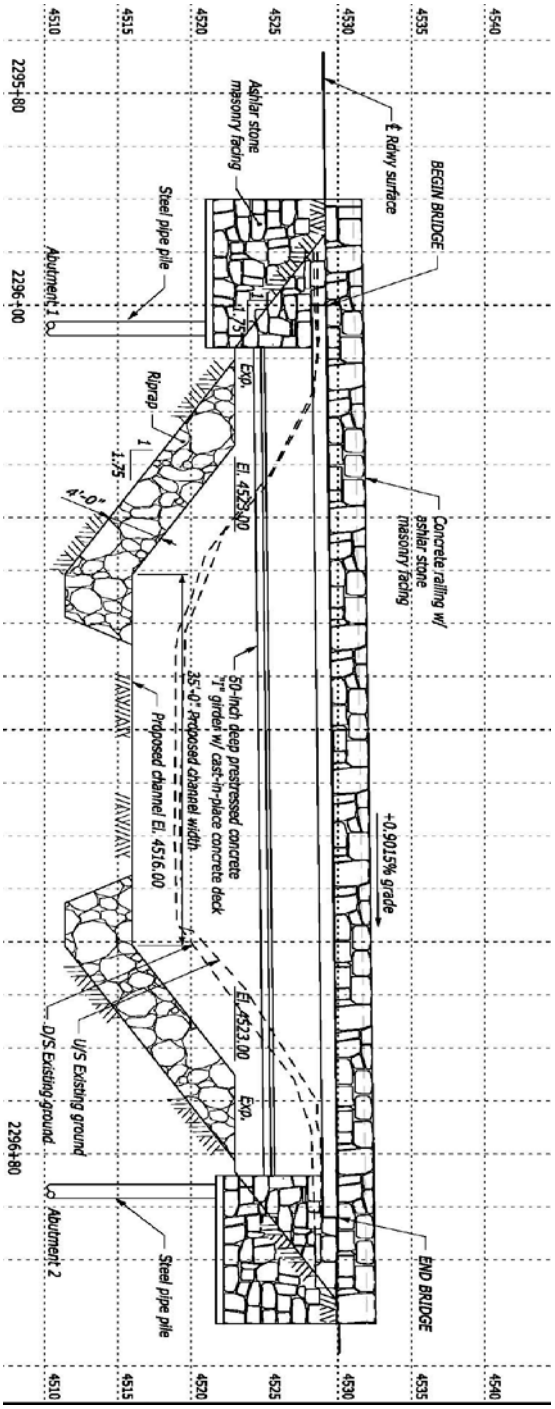


Figure 1: Preliminary design layout for the new Rose Creek Bridge; typical bridge section depicting elevations.

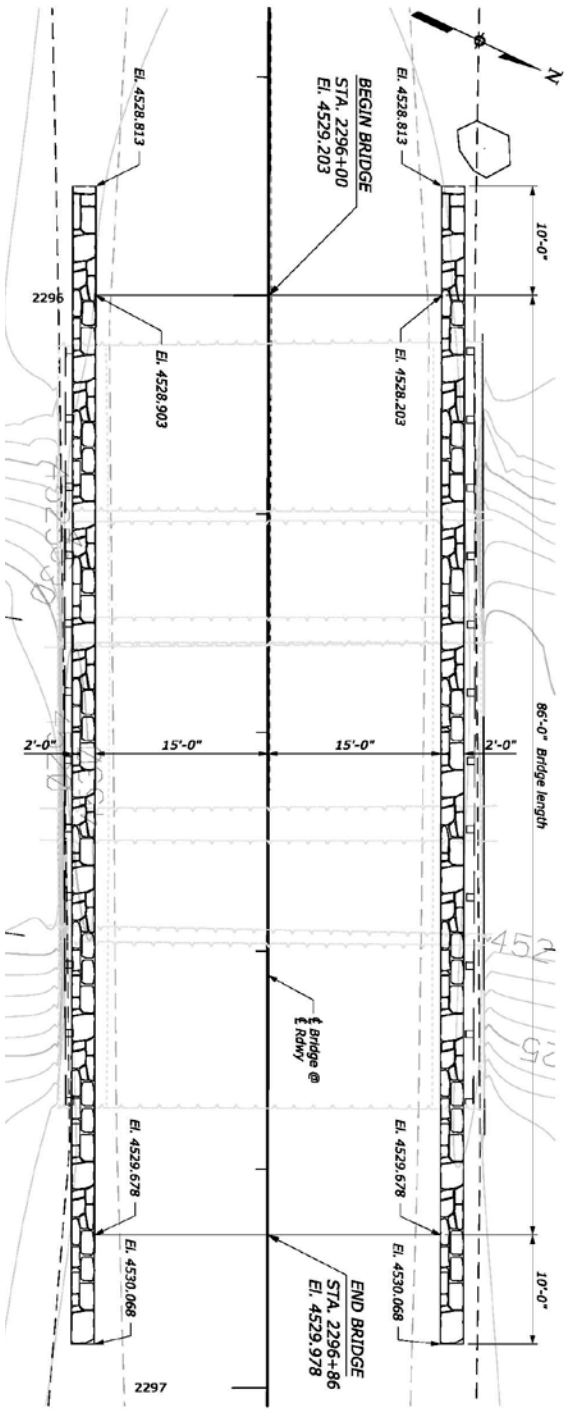


Figure 2: Preliminary design layout for the new Rose Creek Bridge; grade diagram.

National Park Service
U.S. Department of the Interior

Glacier National Park
Waterton-Glacier International Peace Park
Montana

STATEMENT OF FINDINGS FOR FLOODPLAINS

Rose Creek Bridge Replacement

Glacier National Park, Montana

INTRODUCTION

Glacier National Park (GNP) has prepared and made available an Environmental Assessment (EA) analyzing alternatives for replacing a bridge on lower Rose Creek, located below the Rising Sun developed area along the Going-to-the-Sun Road (GTSR) (Figure 1). The EA also assesses a proposal to remove a weir on Rose Creek upstream of the Rising Sun developed area. Removing the weir would not adversely affect floodplains, and the action to remove the weir is therefore not further discussed in this Statement of Findings.

The Rose Creek Bridge presents a barrier to fish passage, as the bridge's piers are connected by a solid concrete sill that spans the width of the stream. Water passes over the sill in a sheet flow, making upstream passage for fish difficult and causing the removal of sediments, or scouring, on the downstream side (Figure 2). The mid-channel piers have altered sediment transport through the reach and caused channel aggradation upstream of the structure. During periods of low flow in the summer and fall, a drop created by sediment scouring on the downstream side of the sill is approximately 2-3 feet high and likely prevents fish from migrating upstream. Sediment scouring and degradation of the natural stream channel have begun to undermine the bridge's long-term structural stability.The abutments are showing signs of settling, and maintenance will increase as the concrete ages. The bridge's span is also too narrow to accommodate small shifts in the stream channel over time.

Additionally, the appearance of the bridge is not compatible with the historic design characteristics of original structures and other features along the GTSR, a notable National Historic Landmark. The original 1932 bridge was severely damaged by a flood in 1964. When it was rebuilt the same year, the original rubble stone wing walls and railing were replaced with concrete and steel tube railing. This blend of contemporary materials with earlier features does not clearly represent historic design principles of either era, and the bridge is the only large structure along the GTSR that is not in keeping with the road's historic design characteristics.

The NPS is proposing to replace the existing Rose Creek Bridge with a new, approximately 85 foot-long clear span bridge. Replacing the bridge would remove a seasonal barrier to fish passage and improve stream flow and sediment transport. The appearance of the new bridge would be more compatible with the historic design characteristics of the GTSR.

Executive Order 11988 ("Floodplain Management") requires the NPS and other agencies to evaluate the likely impacts of actions in floodplains. NPS Director's Order #77-2: Procedural Manual 77-2: Floodplain Management provides NPS policies and procedures for complying with EO 11988 (NPS 2003). This Statement of Findings (SOF) has been prepared in accordance with the NPS floodplain management procedures.

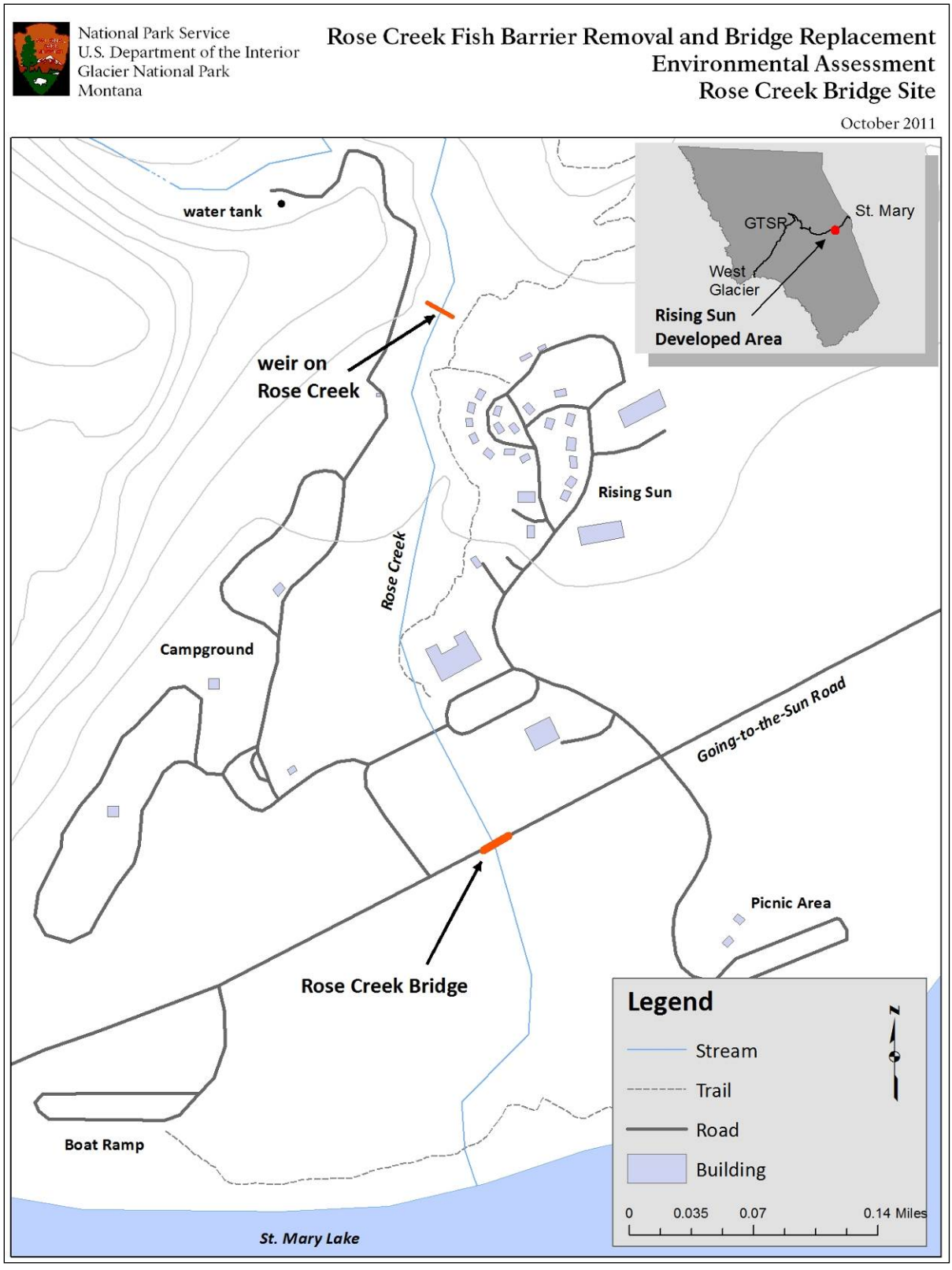


Figure 1: Rose Creek Bridge project area, Glacier National Park, Montana.

Figure 2: Rose Creek Bridge, Glacier National Park, Montana.

PROPOSED ACTION

Under the proposed action, the Rose Creek Bridge would be replaced with a new, approximately 85 foot-long, clear span bridge (Figures 3 and 4). The existing bridge would be demolished and all concrete and reinforcing steel would be removed and hauled to a disposal site outside the park. The existing girders may be removed without the need for work crews or equipment to access the creek, but some in-stream work involving hand-tools and an excavator would be required to cut the piers and concrete sill into manageable pieces and remove them. The stream may be temporarily diverted as necessary during demolition and removal of the concrete sill, and some native material may be excavated. Once the piers and sill are removed, the stream channel may be graded as necessary through the project area to match upstream and downstream elevations, and shaped to match adjacent existing conditions.

Following demolition, the abutments for the new bridge would be constructed. Because the new bridge would be longer than the existing bridge, excavation for the abutments would occur well away from the stream. Riprap would likely be required to armor and protect the abutments. An approximate total of 1200 cubic yards of native material above the ordinary high water mark and 210 cubic yards of native material below the ordinary high water mark would likely be excavated. Recontouring the banks for riprap and placing the material may require equipment within the stream channel. Demolition of the bridge would begin in mid to late September, when stream flows are low; construction of the abutments and installation of the new girders could extend through December.

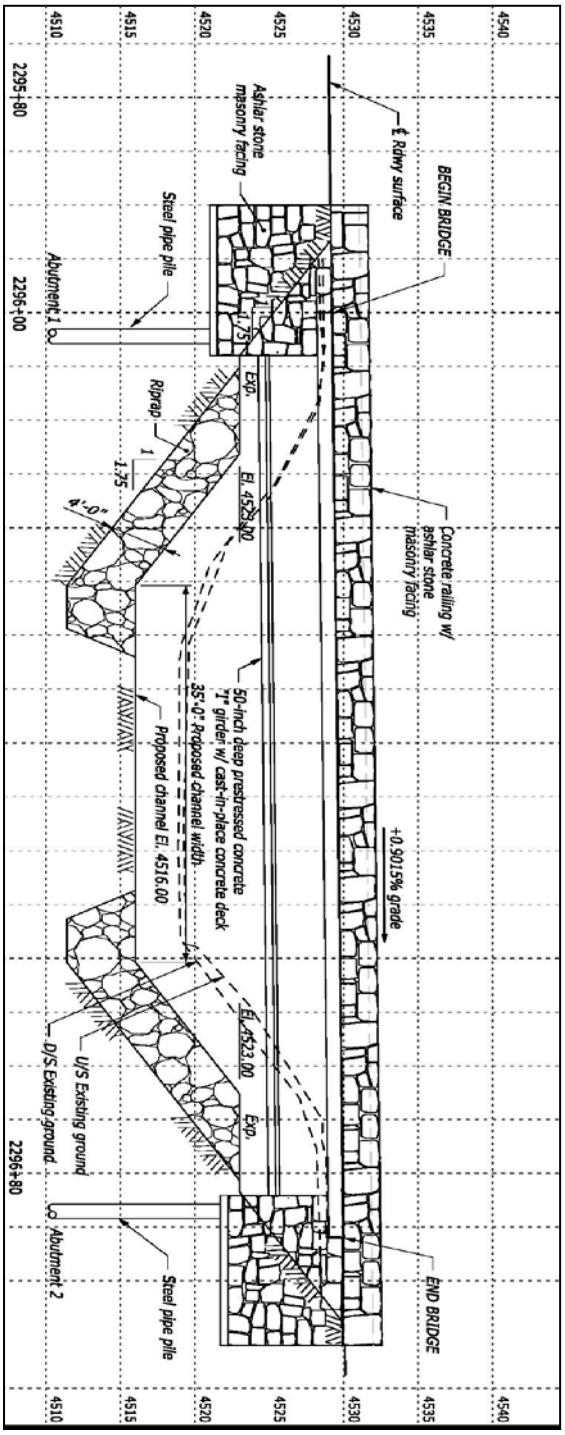


Figure 3: Preliminary design layout for the new Rose Creek Bridge; typical bridge section depicting elevations.

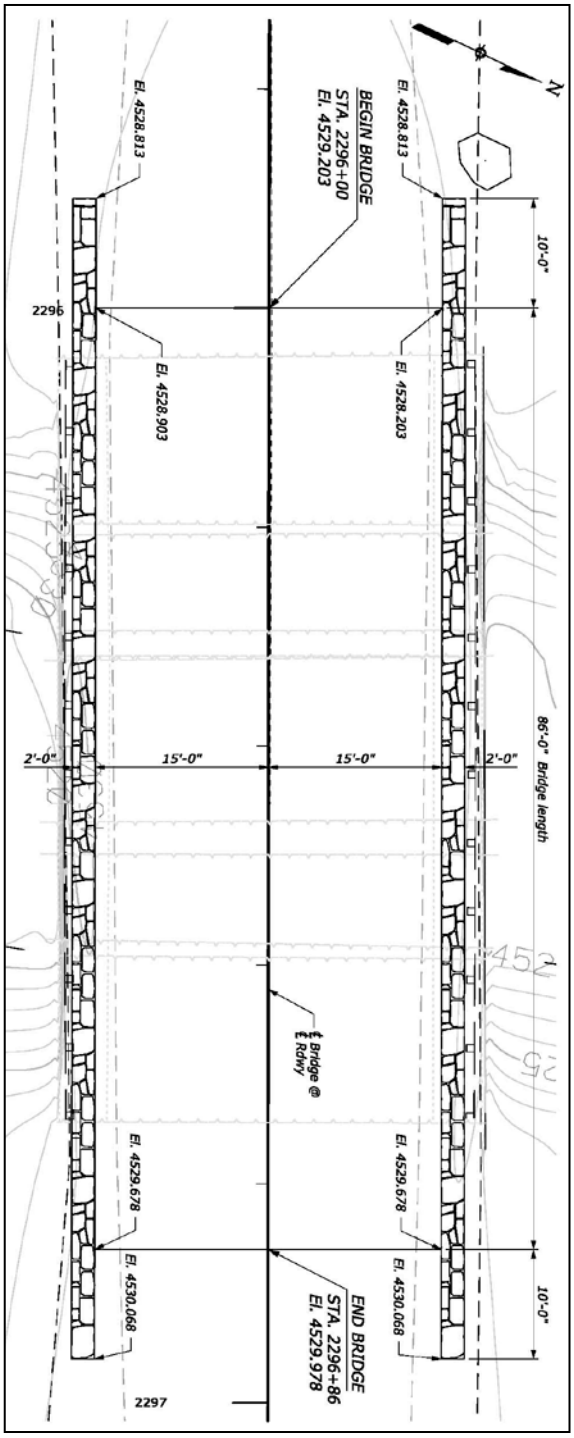


Figure 4: Preliminary design layout for the new Rose Creek Bridge; grade diagram.

SITE DESCRIPTION

Physical Setting

The project area is located in the Rose Creek drainage in Glacier National Park. Rose Creek arises from Otokomi Lake in the St. Mary River drainage on the east side of the park at an elevation of 6,482 foot (1,976 m) elevation, and flows 5.5 miles (8.9 km) before entering St. Mary Lake near Rising Sun campground at an elevation of 4,484 feet (1,367 m). The landform composition of the drainage consists of dissected mountain slope, moderately steep mountain slope, mountain upland and ridges, floodplain landforms, glacial lakes and deposits. Most of the 5,090 acre (2,060 ha) Rose Creek drainage is in recommended wilderness, with the lower portion flowing past the Rising Sun developed area and passing beneath the Rose Creek Bridge along the GTSR.

Upstream of Rising Sun (in the general vicinity of the weir), Rose Creek is formed in a narrow, structurally controlled valley type. The channel is characterized as a moderate to highly entrenched, boulder dominated, riffle-pool stream type. Frequent steps formed by bedrock inclusions and boulder aggregates characterize the reach (River Design Group 2009). Further downstream of the weir, Rose Creek exhibits pool-riffle morphology and is characterized by larger cobble and gravel substrate with frequent boulder inclusions that provide the pool formative structure in the reach. The channel is formed in a glacially scoured valley type with soils derived from moraines and deposited alluvium. Deep, coarse glacial till brackets the channel and is highly erodible due to the dynamic nature of the channel that precludes the establishment of a mature riparian corridor. Bank erosion and avulsive processes are active downstream and contribute fine and coarse sediment to the channel system (River Design Group 2009).

Hydrology

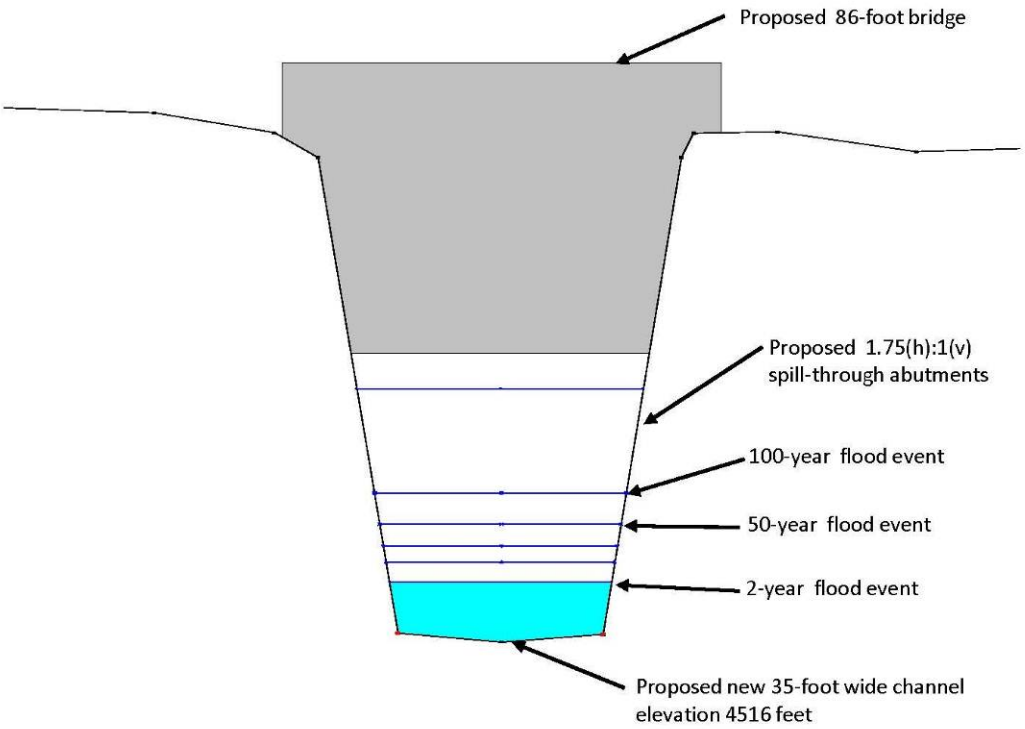
Rose Creek flows in a southeasterly direction from its headwaters, cascading over waterfalls and through boulder and bedrock chutes before opening into a broad alluvial floodplain. Rose Creek is fairly unstable in this reach, with unstable banks eroding into alluvial terraces and large volumes of stored coarse sediment. The total annual sediment load derived from streambanks in the alluvial terrace zone in the lower reaches of Rose Creek has been estimated at 101 cubic yards (River Design Group 2009). Snowmelt, snowmelt charged groundwater, rainfall, and springs are the primary components of the stream flow in the drainage, and water quality would be described as pristine. Rose Creek experiences appropriate peak and base flows, similar to an undisturbed watershed of similar size in a similar geology and geography. Downstream of the project site, erosion/instability is evident where the stream channel cuts into adjacent terraces. Some of this is related to disturbance caused by attempts to reduce flood risk and keep the stream flowing under the existing bridges, but some degree of instability would be natural as the stream cuts through unconsolidated alluvial and glacial till. Some riprap has also been placed to stabilize lateral movements of the channel. Upstream of the Rising Sun developed area, Rose Creek has appropriate access to its floodplain. At Rising Sun and downstream of the developed area, the creek has incised and has limited ability to interact with its floodplain. Flood and erosion control measures have also impacted the ability of the creek to access its floodplain or develop a new floodplain at a lower base level.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

By nature of the intent of the project (restore fish passage and improve sediment transport beneath an existing bridge, and address the bridge's structural concerns and incompatible historic design elements), the new bridge must be located in the floodplain. The abutments themselves would have negligible impacts on floodplain function because the channel has downcut in the project reach and already has little opportunity to interact directly with its floodplain. At most, the abutments would occupy the floodplain and displace some water during flood flows over a very short distance of the stream. In addition, development on both sides of the channel limit the stream's ability to access its floodplain.

HECRAS Model Output for Rose Creek Bridge - Proposed Conditions.

Flow Recurrence Interval	Discharge (cfs)	Water Surface Elevation (ft)	Average Channel Velocity (fps)	Maximum Channel Velocity (fps)
2-year	280	4519.7	4.4	5.9
50-year	845	4521.1	6.8	8.4
100-year	1210	4521.7	7.9	9.3



HECRAS modeled cross section immediately upstream of proposed bridge.

INVESTIGATION OF ALTERNATIVE SITES

There are no alternative locations for the new Rose Creek Bridge. The GTSR crosses Rose Creek at the Rising Sun Campground and developed area and has done so since 1932. There are no alternative locations that would avoid having to cross Rose Creek.

SITE-SPECIFIC FLOOD RISK

Flood boundaries along lower Rose Creek are not easily determined, but there is a potential 100-year floodplain south of the GTSR and another floodplain north of the road where the creek passes through the Rising Sun developed area (NPS 2004). The 1964 flood nearly destroyed the historic bridge, and a flood in 1995 washed away soils and vegetation restored following rehabilitation work on the GTSR. Flooding could occur frequently in the area, but there would be enough time to issue a flood warning and evacuate people to safe areas should the need arise (NPS 2004). An Evacuation Plan for the area is in place and recently updated April 28, 2011.

MITIGATION

Replacing the existing bridge with a new clear span bridge would mitigate existing adverse impacts to flood flows from developments along lower Rose Creek. The removal of the concrete sill between the existing bridge's piers would remove some restrictions to flood flows and improve flood flow capacity. The new bridge has been designed for structural durability and minimal resource impacts. The new bridge would be longer than the existing bridge, and the abutments would be located well away from stream flows.

Work would be completed during the fall at low flow periods, and any disturbances to floodplain soils during project implementation would be remediated by spring flows.

SUMMARY

The preferred alternative was designed to achieve project objectives while considering the floodplain values of the area. The proposed action would remove an obstacle to flood flows by replacing the existing Rose Creek Bridge with a new clear span bridge. The project would have negligible impacts on floodplain function because the channel has downcut in the project reach and already has little opportunity to interact directly with its floodplain. Due to the nature of the project (restore fish passage and improve sediment transport, and address structural concerns, the GTSR's status as a National Historic Landmark and incompatible historic design elements of the existing Rose Creek Bridge), placement of the new bridge in the floodplain is unavoidable.

Therefore the NPS finds this proposed action is consistent with the policies and procedures of NPS Director's Order #77-2: Procedural Manual 77-2: Floodplain Management which provides NPS policies and procedures for complying with Executive Order 11988.

REFERENCES

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