U.S. Department of the Interior
National Park Service

North Cascades National Park Service Complex
Lake Chelan National Recreation Area
Washington

Stehekin Valley Road Improvement Project Environmental Assessment

June 2005

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North Cascades National Park Service Complex
810 State Route 20
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ACRONYMS

ACHP	Advisory Council on Historic Preservation
BA	Biological Assessment
BMPs	Best Management Practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
Corps	United States Army Corps of Engineers
dBA	decibels (A-weighted average)
dbh	diameter at breast height
DO	Director’s Order
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FHWA	Federal Highway Administration
ft	feet
ft^2	square feet
GMP	General Management Plan
MP	Milepost
msl	mean sea level
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOCA	North Cascades National Park
NPS	National Park Service
NRA	National Recreation Area
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OHM	ordinary high water mark
ORV	outstandingly remarkable values
PMIS	Project Management Information System
TESC	Temporary erosion and sediment controls
T&E	Threatened and Endangered
USDOI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VA	Value Analysis
WDFW	Washington State Department of Fish and Wildlife
WFLHD	Western Federal Lands Highway Division
WSRA	Wild and Scenic Rivers Act
yds^3	cubic yards

INTRODUCTION

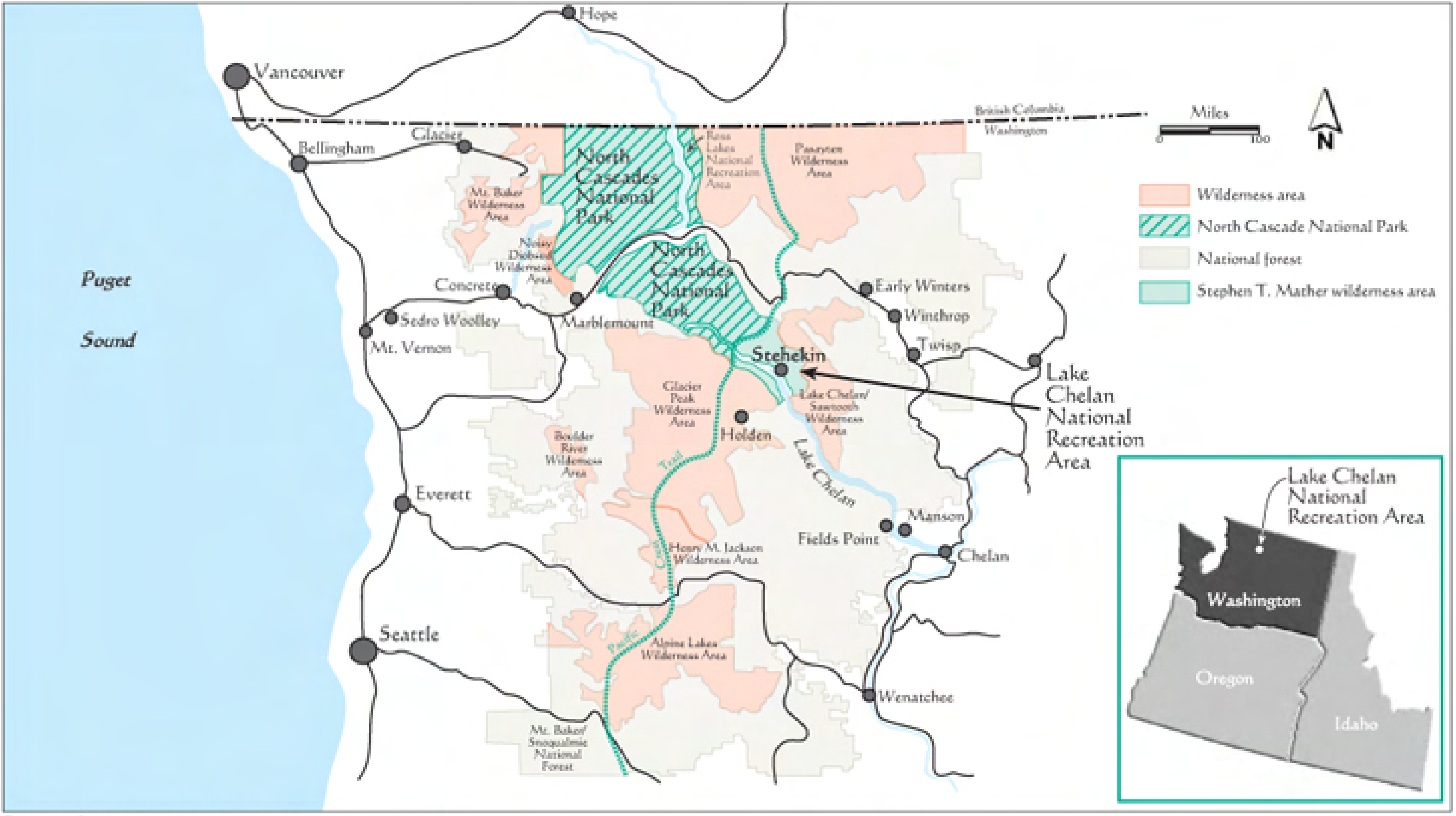
This environmental assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations (40 CFR Parts 1500-1508); National Park Service Director's Order (DO) 12 and Handbook (*Conservation Planning, Environmental Impact Analysis, and Decision-making)*; Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended, and its implementing regulations (36 CFR Part 800), and related guidance and applicable Executive Orders.

The proposed project is to make safety and road maintenance improvements to approximately 5 miles of the Stehekin Valley Road, to rehabilitate the road following recent flood damage (October 2003), to protect the road from further flooding, and to reduce the use of locally secured gravel. The 23-mile long Stehekin Valley Road originates at the north end of Lake Chelan at Stehekin Landing and parallels the Stehekin River providing access to National Park Service (NPS) facilities, trailheads, camping areas, and recreational activities, as well as private property within the Stehekin River valley. The road terminates near the Cottonwood campsite where it becomes the trailhead leading to Cascade Pass, Horseshoe Basin, and Sahale Glacier. A record flood (October 2003) severely damaged portions of the upper road above milepost (MP) 11 and the future of the road above this point is uncertain. Currently, there are only 9.1 miles of continuous road accessible to vehicles along the original 23 miles of the Stehekin Valley Road (above MP 9.1 there is a road washout at Coon Run).

The project is located within the Lake Chelan National Recreation Area (NRA), which is located in the Cascade Mountains of northern Washington State (Figures 1 and 2). NPS administers the Lake Chelan NRA, as well as two other units of the National Park system under the umbrella of the North Cascades National Park Service Complex. These include the North Cascades National Park (NOCA) itself, and the Lake Chelan and Ross Lake NRAs. Approximately 93 percent of NOCA also constitutes the Stephen T. Mather wilderness area.

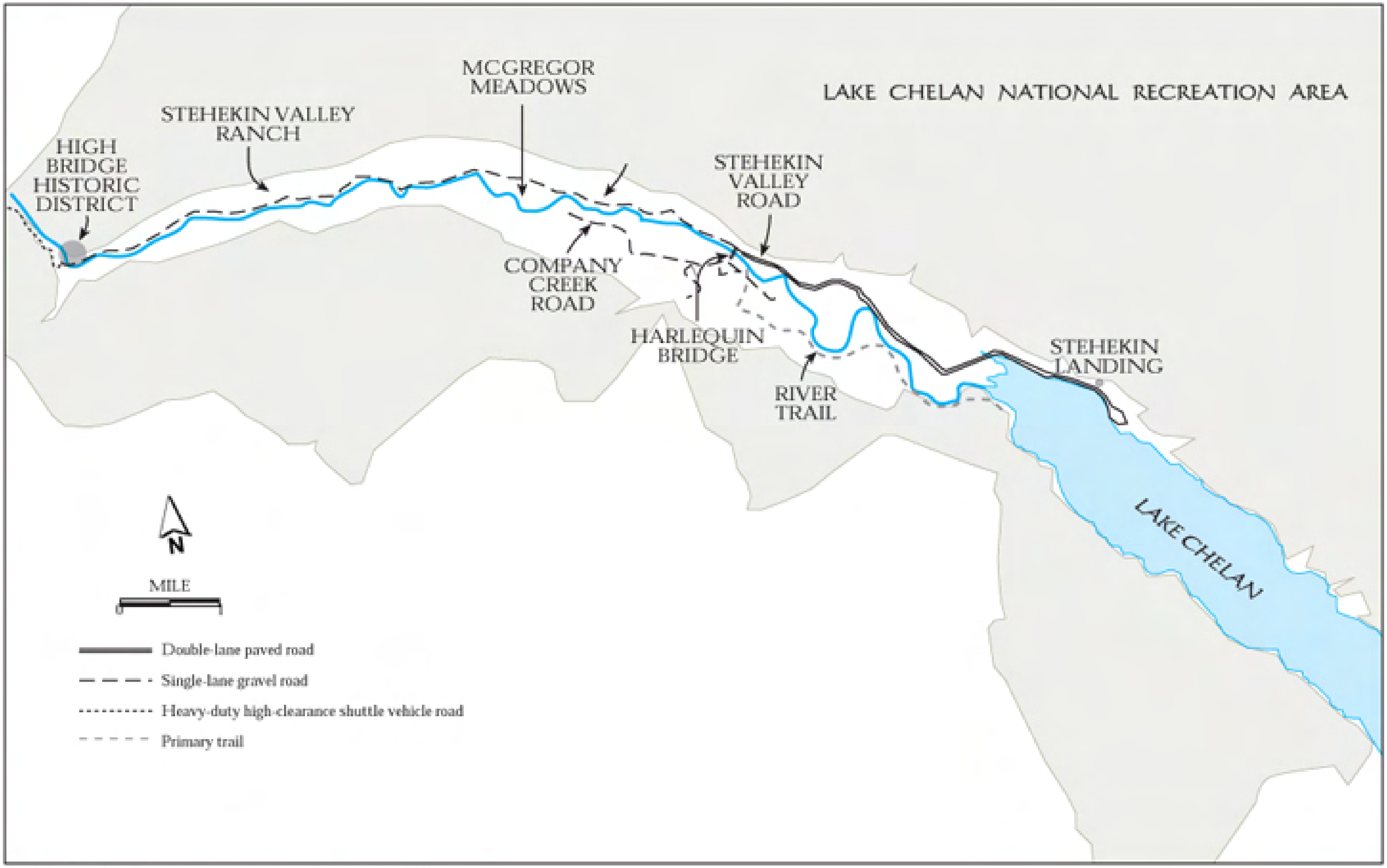
The project involves improvements to the 5.15-mile section of the Stehekin Valley Road from Harlequin Bridge to the winter turnaround above the Stehekin Valley Ranch at milepost (MP) 9.15. This project would connect to the only paved portion of the road, which extends from Harlequin Bridge approximately 4 miles to the Stehekin Landing. The project segment of the road is one-lane and unpaved (i.e., gravel), and winds through a flat valley paralleling the Stehekin River that is hemmed in by steep valley walls. Consequently, portions of the roadway are either located within the river floodplain (that is prone to frequent flood events) or lies in close proximity to the bank of the river (in many places the river bank is rapidly eroding). This has resulted in repeated damage to the road and the need to make emergency repairs including cutting in new road alignments.

Over the past 15 years there have been six large flood events. For example, the November 1995 flood was estimated to be a 100-year event. More recently (October 2003), a record 500-year flood event occurred and caused significant damage to the road, which included washing out segments of the road at MP 7.0 and 7.5. Other portions of the road in the project area also need improvements as a result of previous floods, continuing river erosion, or for safety reasons. For example, at MP 5.3 river erosion is occurring at a river bend that affects the toe of the slope supporting the road. River erosion is also affecting the road slope around MP 8.0. In several other areas the road grade needs to be raised 1-3 feet (ft) to its former level because of road erosion caused by flood damage (e.g., MP 6.5, MP 7.0, and MP 8.0). In addition, there are road sections with horizontal or vertical sight distance problems and areas where steep slopes adjacent to the road are sloughing off material onto the road. NPS plans call for improving and paving this section of roadway and making flood damage related repairs and improvements.



Parametrix Stehekin Valley Road Project 557-3072-011/01(03) 5/04 (K)

Figure 1
Lake Chelan National Recreation Area Region



Parametrix Stehekin Valley Road Project 557-3072-011/01(03) 5/04 (K)

Figure 2
Stehekin Valley Vicinity

PURPOSE AND NEED

The purpose of the proposal is to rehabilitate and pave a 5.15-mile section of the Stehekin Valley Road, make erosion control and safety improvements, and flood related road repairs to facilitate park operations, protect resources, and improve visitor experience.

The proposed project is needed because of several problems in maintaining the operation of the Stehekin Valley Road. Sections of the road lie within the active floodplain erosion zone of the Stehekin River or are located in close proximity to the eroding riverbank. The river carries high volumes of water and frequently floods (there have been large floods in 1989, 1990, 1995, 1997, 1999, and 2003) causing erosion and washing out or flooding portions of the road. This causes periods of temporary road closure and disrupts access to the upper Stehekin Valley. NOCA staff needs uninterrupted access to the upper Stehekin Valley and interior of the park to carry out their mission.

The continued maintenance and repair of the road involves placing gravel over the road surface, which contributes eroded sediment during storm water runoff or floods that enters creeks and the Stehekin River thus affecting water quality. The gravel road also results in dust generation during dry periods, which coats vegetation next to the roadway adversely affecting vegetation and reducing the visitor experience. In order to maintain the road gravel must be extracted locally from the Company Creek borrow pit or barged in. The Company Creek Pit is a limited resource and its use is strictly regulated to minimize the depletion of this resource (to preserve the resource for other uses). The alternative is to barge in gravel, which is expensive. By paving the road dust would not be generated, eroded sediment would be reduced, and it would not be necessary to mine gravel from the Company Creek borrow pit.

There are areas where the road and river are located in close proximity and riverbank erosion threatens the stability and usability of the road. Paving the road and moving the road farther away from the river would reduce impacts on water quality (i.e., eroded sediment from the unpaved gravel road), help preserve flood storage capacity nearer to the Stehekin River, and allow the river to meander more naturally in those areas where the road is moved (these actions would help to meet the goals for the Stehekin Valley Road and Stehekin River as described in the Lake Chelan NRA General Management Plan – refer to section below). In other areas, riverbank stabilization is proposed, and while this would not allow for the natural movement of the river, it would protect the road from failure and lessen the need to reroute the road or make emergency repairs in the future.

Paving the road would provide another benefit to park operations by facilitating snow removal during the winter (the road is plowed from Stehekin up to the turnaround at MP 9.15). Currently, the graveled roadway becomes uneven by vehicle use and erosion resulting in potholes, which can cause damage to the snowplow during snow removal. Plowing the gravel road also results in pushing gravel off to the side of the road, thus more gravel is required to maintain the road. Paving the road would make a smooth surface that is less likely to damage the snowplow and there would not be a recurring need to re-gravel the surface of the road. Park operations would thus be improved.

The project is also needed to improve the visitor experience. There are safety problems with the existing road including sight distance problems caused by sharp horizontal or vertical curves. There are also road sections that are prone to flood damage as described above, which interrupts visitor access into and out of the park (flooding also causes damage to visitor facilities such as trails and campgrounds). Vehicles on the unpaved road generate dust, which coats vegetation and diminishes visual quality. Maintaining access, increasing driving safety, and paving the road would improve the visitor experience.

PURPOSE AND SIGNIFICANCE OF THE PARK

This project is being developed consistent with NPS regulations and guidelines, and other laws and policies, as identified below. The laws, policies, and associated regulations provided direction for the design of project alternatives, the analysis of impacts, and the formulation of mitigation measures. The intent of these laws and policies is to establish sustainable conservation, to avoid impairment of NPS resources, and to preserve the significance of cultural and natural resources.

Enabling Legislation, Purpose, and Significance of the Lake Chelan National Recreation Area

Public Law 90-544 (section 402) established the Lake Chelan NRA on October 2, 1968 with a purpose of providing for the public, "…outdoor recreation use and enjoyment of portions of the Stehekin River and Lake Chelan, together with the surrounding lands, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment of such lands and waters" (NPS 1968). In 1988, 56,335 acres of the 61,889-acre Lake Chelan NRA were designated as wilderness. An additional purpose of the unit, based on NPS statutory policy, is to preserve for future use and enjoyment, the character and values of the designated wilderness.

The significance of the Lake Chelan National Recreation Area is defined as follows:

> *"An uncommon diversity of vegetation types resulting from the distinct climatic regimes and topography, which provide essential habitat for a large number of dependent wildlife species, including rare and sensitive species.*
>
> *Natural hydrologic processes and excellent water quality of the Stehekin River and its tributaries support a diverse riparian community and provide essential habitat for native fish species.*
>
> *A large wilderness area with the values of silence, solitude, and opportunities for primitive recreation, with spectacular pinnacles, massifs, and spires bounded by glaciers, snowfields, and alpine meadows.*
>
> *Excellent air quality, expansive vistas, and pristine views of impressive glacier-carved mountains and valleys, glaciers, many vegetative communities with contrasting colors and textures, cascading waters of the Stehekin River and its tributaries, Lake Chelan, and many high mountain lakes.*
>
> *Historic structures and settings associated with early settlement and recreation of the Stehekin Valley, including sites such as the Courtney cabin, the Buckner homestead and orchard, Stehekin School, and the Golden West Lodge Complex.*
>
> *Pictographs and scattered archaeological sites associated with early Native American Indian use and occupation" (NPS 1995*).

NPS Management Policies

NPS management policies provide the management directives for making decisions in the National Park System. These policies cover the following topics: park foundation, park system planning, land protection, natural resource management, cultural resource management, wilderness preservation and management, interpretation and education, use of parks, park facilities, and commercial visitor services.

RELATIONSHIP OF THE PROPOSED ACTION TO OTHER PLANNING EFFORTS

Lake Chelan National Recreation Area, General Management Plan

The GMP for the Lake Chelan NRA is the principal document that guides management, including recreation and development. This document, developed through extensive discussion and interaction with various stakeholders, describes the degree to which NPS will balance visitor use and enjoyment with resource protection.

The GMP sets policies with regard to the Stehekin River and Stehekin Valley Road. According to the GMP, the NPS objective for the management of the Stehekin River is to protect water quality, and preserve and restore the free-flowing character and natural processes to the Stehekin River and its tributaries. While the river would not be manipulated to protect private property, an exception is made for the repair of existing bridges and roads such as the Stehekin Valley Road that lie in active river erosion zones. The GMP provides specific direction for the long-term maintenance of the Stehekin Valley Road, and recommends paving of the road from Stehekin Landing to MP 9.0.

As stated in the GMP, all road maintenance projects are subject to the following criteria: (1) There are no reasonable alternatives, (2) Funds are available, (3) The actions will have less impact than other alternatives, and (4) The actions are permitted by other agencies. Previously manipulated sites that do not meet these criteria would be restored to approximate natural conditions.

The proposed project would comply with the Lake Chelan NRA GMP objectives by protecting the Stehekin Valley Road and maintaining access to the upper valley, while preserving water quality and contributing to the restoration of the free-flowing character and natural processes of the Stehekin River.

North Cascades National Park Service Complex Wilderness Management Plan

The Wilderness Management Plan identifies the framework for how the park will manage the natural resources and pass the spirit of the North Cascades on to the next generation unimpaired. The goals and objectives section of the Wilderness Management Plan are tied directly to the objectives of the GMP. For the NOCA Complex, it will be managed "…so as to conserve, maintain, enhance, or restore the wilderness, natural resources, and those ecological relationships and processes that would prevail were it not for human influences."

Stehekin Valley Road Erosion at Mile 8, Environmental Assessment (1993)

The Mile 8 EA evaluated five alternatives, four alternatives to prevent a potential washout of the Stehekin Valley Road at MP 8.0 and a no action alternative. The action alternatives included riprap bank protection, rerouting the road away from the river, placing riprap and constructing two or three current deflectors, and bioengineering.

The preferred alternative was to use bioengineering: constructing two rock barbs in the Stehekin River spaced approximately 200 ft apart (this alternative placed less riprap in the river than some of the other alternatives considered). The rock barbs consisted of approximately 500 yds^3 of material and protruded into the river approximately 10 ft. Vegetation was incorporated into the rock barbs to improve the habitat value. The preferred alternative also included reducing the road width in this area to 16 ft, and revegetating the road/river bank above the 10-year flood elevation to help stabilize the road.

The project was implemented in 1994 just upstream of the work that is being proposed under the current project. The 1994 work has held up through a number of flood events, thus has been successful. The current proposal would extend this work downstream.

Lake Chelan Land Protection Plan (1995)

This plan calls for the protection of cultural and natural resources, the provision of safe visitor facilities, services for the health, safety, and welfare of the Stehekin Valley residents, and the protection of high flood influence areas, wetlands, riparian zones, and areas with high visual sensitivity.

Lake Chelan Transportation Plan (1995)

This plan proposed that between Harlequin Bridge and MP 9.0, the Stehekin Valley Road would be paved and reduced to a single lane (12 to 14 ft wide) with pullouts that would be visible from one another. The pullouts would be 30-35 ft long and 18 ft wide. The plan also outlined criteria for protecting public roads south of Cottonwood that are in active river erosion zones. Other criteria for future roadwork would include: (1) There are no reasonable alternatives, (2) Funds are available, (3) The actions will have less impact than other alternatives, and (4) The actions are permitted by other agencies. New road construction in the Stehekin Valley is prohibited.

The proposed project meets the criteria outlined in the plan and would implement that portion of the plan that calls for paving and improving the road from Harlequin Bridge to MP 9.15.

Lake Chelan Sand, Rock, and Gravel Plan (1995)

This plan stipulated that no sand, rock, or gravel would be removed from the 100-year floodplain of the Stehekin River or its tributaries and that material needed for construction would be barged in. It projected that the paving of the Stehekin Road from Harlequin Bridge to MP 9.0 would reduce gravel use, but anticipated that road repairs may be required following flood events. It did not address specific projects such as relocating the road farther away from the river. It does specify when and for what purposes material from the local Company Creek Pit in Stehekin may be used.

This plan relates to the proposed project because some material from the local Company Creek Pit could be used for certain aspects of the project. The proposal would need to comply with the plan thus material from this source could only be used in certain instances such as to repair flood damaged road sections. Most of the earth related material needed for the current project would be barged in from an outside source.

Forest Fuel Reduction Plan/Firewood Management Plan (1995)

The Forest Fuel Reduction Plan was developed and implemented to reduce forest fuel accumulation in selected coniferous stands in the Stehekin Valley. The goal was to protect the safety of human life and property in the valley, protection of natural and cultural resources, and restoration of the forest to a late successional stage, as well as to protect old growth forest, particularly ponderosa pine. This document provided a plan for selective thinning and use of management ignited controlled fires to reduce the fuel supply and risk of wildfires. It specifies the disposition of firewood obtained from tree thinning and also provides for long-term monitoring of the program to evaluate the management actions.

The plan is related to this project in that the Stehekin Valley Road is the only route for evacuating people out of the valley in the event of a fire. Protection of the road from fire is an important part of the strategy to protect park users and local citizens from wildfire.

Protection of the Stehekin Valley Road in the Vicinity of McGregor Meadows, Environmental Assessment (2003)

This EA analyzed three action alternatives and no action. The action alternatives included constructing grade control structures (preferred alternative), raising the entire roadbed through McGregor Meadows, and rerouting the road out of the floodplain. The preferred alternative was to construct eight to ten grade control structures (large angular rocks) above pilot channels in McGregor Meadows. This action would maintain sheet flow during flooding and minimize channelization of floodwater flow down the Stehekin Valley Road, which would reduce scouring of the road. Each grade control structure would use one to two yds^3 of large angular rock. Thus, the total fill for the control structures would be 10 to 20 yds^3 of rock. This alternative was not seen as a permanent fix for the flooding and erosion problem, but would result in a partial short-term solution.

Some aspects of the proposal evaluated in the 2003 EA have been incorporated into the current proposal. For example, the road grade would be raised through McGregor Meadows 1 to 3 ft (the 2003 EA called for raising the road grade 2 ft). However there would not be any control structures constructed in the floodplain nor a road reroute in this area.

Coon Run Road Repair, Stehekin Valley Road, Biological Assessment/ Categorical Exclusion (2004)

A record flood in October 2003 washed out the Coon Run segment of the Stehekin Valley Road, resulting in road damage that prevents access to the upper Stehekin Valley and Park facilities such as campgrounds and trailheads. This section of road begins above the current project area, beginning at approximately MP 9.15. The proposed action would have repaired an approximately 200-foot section of road damaged by the flood. The project proposed to elevate the roadbed three feet above the level of the existing road to prevent flood damage from more frequent flood events. The project also included bounding the road prism with logs, lining the sides with filter fabric, and filling between the logs starting with large rock and progressing to smaller rocks and finally gravel at the top. Approximately, 187 yds^3 of large rock and 560 yds^3 of total fill would have been needed. The proposed action was designed to be a short-term solution to provide access, while longer-term solutions were being explored. This action was dismissed from further consideration, because the current thinking is to reroute the road farther away from the river to reduce the potential flooding of the road in this location (see following Coon Run project).

Restore Stehekin Valley Road Vehicle Access at Coon Run, Environmental Assessment (2005)

This environmental assessment assessed three action alternatives for relocating the Coon Run section of the Stehekin Valley Road that was damaged and washed out in the October 2003 flood. The three alternatives evaluated included constructing a lower road reroute around the Coon Run washout, an intermediate road reroute, or an upper road reroute. All the alternatives would result in moving the road north and up onto a higher terrace above the river. The main difference was how far away from the river the road would be moved. The EA also assessed not providing any future motor vehicle access above the winter turnaround at milepost 9.15 (under the no action alternative). Under no action, park staff would reassess future vehicle access above this point in response to future river dynamics (it is possible that the river may change course and remove the road completely or move to the other side of the valley allowing vehicle access to resume to the upper Stehekin Valley). The preferred alternative was to move the road as far as possible from the river, thus the alternative to construct an upper road reroute was chosen. This alternative would reroute a 3,600-foot section of the road from MP 9.15 up onto a terrace and then down across a bridge over Coon Creek and continue to a point above the area of the washout where it would meet up with the Stehekin Valley Road again. The project would involve clearing (slightly over 1 acre of clearing), removal of approximately 150 trees (greater than 16 inches in diameter), and approximately 1,000 yds^3 of fill material. It would also rehabilitate a total of 3,800 feet of abandoned road.

The Coon Run project abuts the proposal evaluated in this EA and is the next segment of road that needs repair from the recent flood. Thus, the current proposal would affect the design of the Coon Run improvements and vice versa. Therefore, this potential project is included and analyzed in the cumulative impacts scenario.

SCOPING

Scoping is a process that is used to determine the issues that need to be addressed in a NEPA environmental document such as this EA. NPS staff typically conducts both internal and external scoping. Internal scoping is an interdisciplinary process that brings the various NPS resource specialists together to formulate purpose and need, define issues, develop alternatives, identify data needs, and determine any similar or cumulative actions associated with the proposal. External scoping involves gathering comments on the proposal from the public, agencies, and tribes.

Several elements of the proposed road improvement project such as paving the road have been discussed since 1995 when it was first addressed in the Lake Chelan NRA GMP/EIS. Public, agency, and tribal comments were collected on that document, as well as during other related planning efforts (see Relationship of the Proposed Action to Other Planning Efforts above). More recent scoping activities related to the proposed project include NPS internal scoping and several meetings held with the public, tribes, and agencies. Public meetings to discuss the project were held in Stehekin on December 2, 2003, February 17, 2004, and May 12, 2004. A site visit and meeting with the U.S. Army Corps of Engineers (Corps), U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) were held on March 31, 2004. Ongoing discussions are being held with the tribal historic preservation officer for the Colville Confederated Tribes.

ISSUES

Impact topics have been identified on the basis of National Park Service Management Policies (2001), federal laws, regulations, and orders, and NPS staff knowledge of resources along the Stehekin Valley Road. Issues and concerns were identified from internal scoping, and public meetings held in Stehekin. Some of the main issues and concerns included:

- Frequent flooding of the Stehekin Valley Road impacts park operation and visitor experience by reducing access to the interior of the park.
- Construction of riverbank erosion controls would impact water quality and stream flow, because it would be necessary to perform in-water work and the proposed stream barbs would alter stream flow. These structures also affect the natural erosion process of the river.
- Raising the bed of the road, road reroutes, and bank stabilization would occur within the floodplain of the Stehekin River and could alter the characteristics of the floodplain.
- Construction activities would increase noise that may affect visitor experience in the wilderness area surrounding the road.
- Soils and vegetation would be impacted by the road reroutes, which would require clearing and grading and disturbance to soils and vegetation.
- Threatened and endangered species may be impacted in area where the road is moved closer to sensitive nest sites (thus increasing noise and human related disturbance) or from construction noise.
- Use of gravel to maintain the road causes dust, and impacts to water quality, vegetation, and visitor experience. It also requires either gravel extraction from the Park’s Company Creek borrow pit, which is a limited resource or importing material by barge, which is expensive.

NPS staff consolidated the issues and selected the impact topics described below to facilitate the analysis of environmental consequences. A brief rationale for the selection of each impact topic is given below. In addition, a discussion of impact topics dismissed from further consideration and the rationale for dismissing them is located in the following section.

IMPACT TOPICS

Soils

NPS Management Policies (2001) provide for the protection and management of natural resources, including physical resources such as soils. The project would require disturbance of previously undisturbed soils with the concurrent loss of vegetation. There would also be some alteration of the geomorphology because of proposed road cuts and slope regrading at several points along the road alignment such as Wilson Creek. Because of the potential disturbance to soils, this topic is included in the EA.

Water Quality

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, control, and abate water pollution. NPS Management Policies (2001) provide direction for the preservation, use, and quality of water in national parks.

The Stehekin River is a Category 1 waterway that is given maximum protection under state water quality regulations (WAC 173-201A). The alternatives evaluated in this EA would take place within, and in close proximity to, the Stehekin River. Construction activities may include in-water work and earth disturbance, which increases the potential for erosion and sedimentation to occur and can adversely impact water quality. In addition, the current yearly maintenance of the Stehekin Valley Road requires gravel to be placed on the roadway. The use of this material on the road is a source of continuing sediment to the Stehekin River from road/riverbank erosion (for those areas of the road located in close proximity to the river), flooding, and storm water runoff. Because of the potential impacts from sedimentation and work that might occur within and next to the Stehekin River, water quality is being addressed in the EA.

Stream Flow Characteristics

The Lake Chelan NRA GMP/EIS (1995) provides guidelines for actions that affect the Stehekin River and the Stehekin Valley Road, allowing manipulation of the river only for road projects in erosion/river conflict zones under certain conditions. The Stehekin River is prone to severe flooding in spring and fall, which periodically damages the roadway. The largest floods recorded occurred in 1948, 1995, and 2003, and caused large changes to the river and associated damage to the Stehekin Valley Road. When extreme flood velocities and depths occur, the coarse bed load of the river is transported, resulting in rapid erosion of the riverbank and road. The proposed alternatives would involve riverbank improvements to protect the road, which may affect stream flow and the natural erosion processes of the river. Therefore, stream flow characteristics are discussed in the EA.

Wild and Scenic Rivers

The Stehekin River, throughout its entire length, is considered eligible for wild and scenic status. Under the Wild and Scenic Rivers Act (16 U.S.C. 1271-1287), "…certain selected rivers of the Nation, which with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present

and future generations." Some components of the alternatives under consideration could affect the free-flowing characteristic of the river and some of its outstandingly remarkable values (ORVs). Therefore, those wild and scenic rivers characteristics are discussed in the EA.

Floodplains

Executive Order 11988 (Floodplain Management) requires an examination of impacts to floodplains and potential risk involved in placing facilities within floodplains. NPS Management Policies 2001, DO-2: *Park Planning*, and Executive Order 11988 provide guidelines for proposals in floodplains. Since much of the Stehekin Valley Road lies within the 100- or 500-year floodplain of the Stehekin River and the proposed action alternatives would involve construction activities and placement of fill in the floodplain, this impact topic is addressed in the EA.

Vegetation

The NPS Organic Act and NPS Management Policies (2000) serve to protect the components and processes of naturally occurring biotic communities, including the natural abundance, diversity, and ecological integrity of plants. Up to approximately 10 acres of vegetation may be affected by the project including removal or disturbance during construction. There will also be opportunities to enhance vegetation in several areas. Because of the potential changes to vegetation in the project corridor, vegetation is addressed in the EA.

Wildlife and Threatened and Endangered Species

NEPA calls for an examination of the impacts of a project on all components of affected ecosystems. NPS policy is to protect the components and processes of naturally occurring biotic communities, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2000). The proposed alternatives will involve impacts to wildlife such as the removal of wildlife habitat; increased noise levels caused by construction activities, and increased turbidity caused by in-water work. Loss of habitat is a direct impact on wildlife because it affects their nesting/denning and foraging areas. Increased noise levels during construction are likely to result in temporary wildlife avoidance of the immediate areas adjacent to the road. Also, increased turbidity caused by in-water work can have adverse consequences on fish and amphibian species occurring in, and downstream of, areas where disturbance of bottom sediment occurs. Common wildlife species are addressed in the EA because of these potential impacts.

The Endangered Species Act (ESA) requires an examination of impacts from federal projects on all federally listed threatened and endangered (T&E) wildlife species. NPS policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Habitat and T&E wildlife species exist within or near the project corridor and may be affected by the project, particularly during construction activities that may result in potential noise, dust, and sedimentation/siltation impacts. Therefore, this impact topic is addressed in the EA.

Visitor Experience

Providing for the enjoyment of the national park resources is one of the foundations of the NPS Organic Act. The Organic Act directs the NPS to promote and regulate the use of national parks to conserve resources to provide for their enjoyment by existing and future generations. In accordance with this act, NPS Management Policies and DO-17 (Tourism) identify visitor use patterns and the desired visitor carrying capacity, and encourages or allows appropriate recreational activities within the various park units. The Lake Chelan Land Protection Plan (1995) calls for the protection of cultural and natural resources, and the provision of safe visitor facilities and services. Finally, the enabling legislation for the Lake Chelan NRA has as one of its goals to provide for public outdoor recreation use and enjoyment of the Stehekin River and Lake Chelan. Since the Stehekin Valley Road is an integral part of visitor access

into the Lake Chelan NRA, NOCA, and the Stephen T. Mather Wilderness this topic is included in the EA.

Park Operations

The proposed action alternatives would have potential effects on transportation and access during and after construction and affect the quality of the transportation infrastructure, as well as the ability of the park to maintain the infrastructure and conduct park operations. The Stehekin Valley Road is one of the main ways for park staff to access the interior of the park and this road is used by staff to conduct resource surveys, maintain park facilities such as campsites and trails, perform forest fuel reduction tasks (prescribed fire), assist visitors, and patrol for violations of park rules. Since rehabilitation of the road would have long-term effects on the quality of the road and effectiveness of park operations this topic is included in the EA.

IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

The topics listed below were dismissed from further analysis after discussion with NPS resource specialists, and input from agencies and the public during scoping. These issue topics were dismissed because there would either be no impacts or impacts would be at or below a minor level of intensity. Many of these would only have minor, short-term, and localized impacts as a result of construction activities. Detailed rationale for dismissing the specific topics is given below.

Prime and Unique Farmlands

The Farmland Protection Policy Act was implemented to preserve and protect the dwindling supply of farmland in the nation. In 1980, the Council on Environmental Quality (CEQ) directed that federal agencies assess the effects of their actions on farmlands classified by the U.S. Department of Agriculture’s Natural Resources Conservation Service as prime or unique. Use of land for farming and the type of farmland soils are considered in determining prime and unique farmland.

There is not much current use of the land in the Stehekin Valley for farming, except for some pasture and small vegetable gardens. However, historically there was farming associated with homesteads such as the Buckner Homestead. The alternatives would not affect any existing use of land for farming.

The alluvial river soils in the Stehekin River Valley are classified as prime farmland soils (but not unique soils). Generally, the alternatives under consideration would not have an appreciable effect on prime farm soils for several reasons. First, much of the road alignment would not change. Although there would be some road widening in places, there would be little additional loss of farmland soils caused by this work (there may also be some road widening under the No Action Alternative because of the need to continually add gravel to the road surface, which would spread out over time or emergency reroutes due to flooding). Second, under the road reroute alternatives, the topsoil would be preserved and used to rehabilitate the old alignments thus loss of farmland soils in these areas would be minor. Finally, the amount of farmland soil loss compared with the total area of these soils within the valley is very small (less than 1 percent). Therefore this impact topic was dismissed from further analysis in this EA.

Wilderness

The Washington Park Wilderness Act of 1988 (Public Law 100-668) designated the Stephen T. Mather Wilderness, which encompasses 93 percent of the North Cascades National Park Service Complex. The wilderness area does not include the Stehekin Valley Road, but essentially surrounds the road and the area immediately adjacent to the road (the wilderness area is approximately 800 ft away at the closest point). There would be no direct impact on the wilderness, but rather there would be indirect effects on the visitor experience within the wilderness that may result from construction noise or views of construction activity. Several trails are located within the wilderness, which are close to the road project such as the

Rainbow Loop Trail. Persons using this trail and other areas within the wilderness and near the road may be affected by construction noise or views of construction activity. Since the project does not directly affect wilderness and the impacts of construction on the wilderness experience are short-term and localized this topic was dismissed from further analysis in this EA. However, the issue of the potential effects of construction on visitor experience within the wilderness area is addressed under the Visitor Experience section.

Wetlands

Executive Order 11990, NPS Management Policies, and DO-77-1 direct that wetlands be protected and that wetlands and wetland functions and values be preserved. They further direct that direct or indirect impacts to wetlands be avoided whenever there are practicable alternatives. Park staff conducted a wetland survey in 2004 to determine if there were any wetlands in the vicinity of the project. They found that there were no wetlands (Bratten 2004). (There are some areas of the project, particularly near McGregor Meadows which occasionally look wet. These “wet” areas are not wetlands because they do not exhibit wetland soil and hydrologic conditions per the federal definition of a wetland.) Since there are no wetlands in the vicinity of the proposed project, this topic was dismissed from further analysis in this EA.

Threatened and Endangered Plants

The Endangered Species Act (ESA) requires an evaluation of impacts from federal projects on all federally listed rare, threatened, and endangered plant species. Two federally listed plant species were identified by the U.S. Department of the Interior as potentially being present within the project area. These species included: showy stickseed (*Hackelia venusta*) and Wenatchee Mountains checker-mallow (*Sidalcea oregana* var. *calva*) (USDOI 2004). An NPS plant survey conducted on May 19, 2004 revealed no sensitive plant species in the proposed project area, and neither showy stickseed nor Wenatchee Mountain checker-mallow was found during this survey (Bivin 2004). Therefore, this topic was dismissed from further analysis this EA.

Visual Resources

The NPS Organic Act, NPS Management Policies (2001), and the NOCA GMP provide direction for the conservation of scenery in the Lake Chelan NRA that will leave it unimpaired for the enjoyment of the public. Generally, there are limited views of the road in the project area from visitors at the park. Slight views of the road in the project area may be seen from several trails including the Company Creek Trail, Stehekin River Trail, and Rainbow Loop Trail. However, except in the vicinity of McGregor Meadows, forest cover obscures the views of the road from areas likely to be used by most visitors. There are horse trails that parallel the road on the north side that have some intermittent views of the road; however these trails are also generally located away from the road. The alternatives under consideration and road operations are not likely to adversely affect the scenic quality surrounding the road because of the low traffic volumes, the narrow aspect of the road, the lack of large road cuts, and the forested nature surrounding the road.

Views from the road would change slightly in the vicinity of the road reroutes. Generally, the road reroutes would move the road farther from the river, thus the foreground view of the river would be slightly reduced and replaced with a more forested foreground view. The areas where the road is near the river also tend to be where background views that are farther away open up into view sheds because of the reduced forest cover in these areas. Thus, moving the road farther from the river would slightly reduce the opportunities for seeing these more open views. However, it is not anticipated that these changes would adversely affect view sheds, because the road provides many opportunities to see the river and background views. Also, as part of the road improvements, turnouts would be constructed, which would provide places to pull out of the traffic lane, park, and get out and observe the visual scenery. Since the

impact on visual resources would be limited to a small portion of the project (road reroutes) and the impacts would be negligible, this topic was dismissed from further analysis in this EA.

Natural Lightscapes

In accordance with NPS Management Policies (2001), NPS strives to preserve the natural ambient lightscapes, which are resources and values that exist in the absence of human caused light. The alternatives under consideration would not introduce or increase artificial light sources into the environment beyond current or historic levels. Thus, the ability to see the natural features that are visible during clear nights would be preserved. Since the alternatives would not have an effect on natural lightscapes, this topic was dismissed from further analysis in this EA.

Soundscapes

In accordance with NPS Management Policies (2001) and DO-47, *Sound Preservation and Noise Management*, an important part of the NPS mission is preservation of natural soundscapes associated with the national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in the Lake Chelan NRA, together with the physical capacity for transmitting natural sounds. The frequencies, magnitudes, and duration of human-caused sound considered acceptable varies throughout the NRA, but generally greater sound levels are acceptable in more developed areas and lower sound levels in less developed areas.

Construction activities associated with the alternatives under consideration such as excavation, clearing and grading, earth hauling, gravel spreading, and operation of construction equipment and vehicles would generate the primary source of noise from the project (operations are not expected to have an appreciable effect on existing noise levels since the project would not result in an increase in traffic volumes). Construction noise impacts would largely be short-term, localized, and minor. Although there is potential for some impact to visitors or wildlife, mitigation measures would be used to reduce these impacts to a level of minor effect. Mitigation measures would include avoiding construction work during the breeding and nesting period of threatened and endangered bird species, and general construction Best Management Practices such as the following:

- Limit construction to daylight work hours.
- Locate construction equipment as far away as possible from sensitive receptors such as wildlife, visitors, and residents.
- Do not leave equipment idling when not in use.
- Install and maintain mufflers on all equipment.
- Use only well maintained and properly functioning equipment.

Since, impacts would be short-term, localized, and minor and mitigation can be used to further reduce or limit impacts, the soundscapes topic was generally dismissed in this EA. However, potential noise impacts are still addressed under the Wildlife and Threatened and Endangered Species and Visitor Experience sections.

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) was established to promote the public health and welfare by protecting and enhancing the Nation’s air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air quality pollution standards. Further, the Clean Air Act provides that the federal land manager has an

affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts (EPA 2000).

The North Cascades National Park Service Complex is located in an attainment area for all ambient air quality standards (Ecology 2002). Air quality in the park is very good, but can be affected locally by emissions within the park or in the surrounding area and by weather conditions (such as temperature inversions). The project area is designated as a Class I airshed.

Potential construction activities resulting from the action alternatives under consideration such as hauling materials, clearing and grading, and operating heavy equipment could result in temporary increases in vehicle exhaust emissions and fugitive dust in the general project area. Any exhaust emissions and dust generated from construction activities would be temporary and localized, and would likely dissipate rapidly because air stagnation in the Stehekin Valley is rare, except during the winter (which is outside of the proposed construction season). Overall the action alternatives could result in negligible degradation of local air quality, but the effects would be temporary, lasting only as long as construction.

Paving the road would reduce the level of dust currently produced by vehicle travel over the unpaved road, thus reducing fugitive dust emissions over time. Dust reduction would be one of the primary achievements of the project and produce long-term beneficial effects on air quality, helping to preserve the Class I status of the airshed. Since the project would provide long-term beneficial effects and adverse impacts would be negligible, short-term and localized, this topic was dismissed from further analysis in this EA.

Environmental Justice

Executive Order 12898 (General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) requires all agencies to incorporate environmental justice into their missions by identifying and addressing any disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. The alternatives under consideration are not expected to have an effect (either beneficial or adverse) on low-income or minority populations. Thus, this topic was dismissed from further analysis in this EA.

Socioeconomic

NEPA and DO 12 direct that socioeconomic aspects of a proposed action be considered as part of the environmental documentation. Socioeconomic values consist of local and regional businesses including Park concessions, and the overall local and regional economy. The alternatives under consideration would have no adverse impacts on the socioeconomic structure or condition of the local or regional economy. There could be slight short-term beneficial effects from the alternatives including increased expenditures into the regional economy for construction materials and employment during construction. There would be no adverse or beneficial effects in the long-term for businesses and the economy, thus this topic was dismissed from further analysis in this EA.

Cultural Landscapes

Director's Order 28 (*Cultural Resource Management Guidelines*) provides direction for managing cultural landscapes. According to DO-28, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. A 2004 survey conducted by park staff found no significant cultural landscape features within the proposed road reroute areas or along the existing alignment. Since there are no cultural landscape features in the project area and the alternatives under consideration would not appreciably change the existing pattern of natural and human influenced environments, this topic was dismissed from further analysis in this EA.

Archeological Resources

NEPA, the National Historic Preservation Act (NHPA), Executive Order 11593, the Archaeological and Historic Preservation Act (AHPA), NPS Organic Act, NPS Management Policies (2001), and the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation require the consideration of impacts on archaeological resources either listed in, or eligible to be listed in, the National Register of Historic Places (NRHP). There are 33 archeological sites recorded in the Lake Chelan Recreation NRA and of these sites, 25 are prehistoric. An archaeological survey in the project area was conducted in June of 2004 and no pre-contact age archaeological sites were located in or near the project area. Also, no archaeological sites are listed in, or have been determined eligible for the National Register of Historic Places. Because there were no archaeological resources in the project area, this topic was dismissed from further analysis in this EA.

Museum Collections

NEPA, NHPA, NPS management policies, DO-28, and Cultural Resource Management Guidelines require the consideration of impacts on museum collections. No museum collection items are currently stored or exhibited in the proposed project area, therefore this topic was dismissed from further analysis in this EA.

Prehistoric and Historic Structures

NPS management policies and guidelines for cultural resource management (DO-28) direct parks to consider potential impacts of planned actions on cultural resources, including prehistoric and historic structures. While there are historic structures within three historic districts in the Stehekin Valley, they are not located in the project vicinity and there would be no project impacts on any historic structures or the historic districts. Therefore, this topic was dismissed from further analysis in this EA.

Ethnographic Resources

NPS management policies and guidelines for cultural resource management (DO-28) direct parks to consider potential impacts of planned actions on cultural resources, including ethnographic resources. Ethnographic resources are defined as any "…site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (DO-28). It is known that several tribes traditionally used the Stehekin River valley for hunting, foraging, subsistence, and occupation, and that the Lake Chelan NRA holds many resources important to tribes such as wildlife, plants, and water. Thus, it is likely that some types of resources would occur in the project area. However, no specific ethnographic resources have been identified in the project area, and none have been determined eligible to the National Register of Historic Places. NPS is consulting with the Colville and Yakama tribes about the proposed alternatives under consideration. If the tribes identify any ethnographic resources or if ethnographic resources are discovered during construction appropriate mitigation measures would be undertaken, including consultation with the tribes and the State Historic Preservation Office. Because there are no known sites, this topic has been dismissed from further analysis in this EA.

Land Use

NPS Management Policies (2001) provide direction for protection of lands and resources within park units, acquisition of non-federal lands that are within park units, and cooperation with agencies, tribes, and private property owners to provide appropriate protection measures. The Lake Chelan NRA GMP provides the framework for the types of land uses allowed within the project area. Since the alternatives under consideration would not affect the existing land uses or the protection of land use in the Stehekin Valley, this topic was dismissed from further analysis in this EA.

ALTERNATIVES CONSIDERED

This EA examines four alternatives:

- Alternative 1 – No Action
- Alternative 2 – The Preferred Alternative
- Alternative 3 – Minor Improvements
- Alternative 4 – No Road Reroute at MP 7.0

The project was originally envisioned as part of the Lake Chelan NRA GMP proposed action, which called for improving and paving the first 9 miles of the Stehekin Valley Road. Alternatives to accomplish this were developed through NPS staff input and scoping, by performing Value Analysis (VA) studies and resource surveys, and in response to flood events.

NPS and WFLHD staff conducted a Value Analysis (VA) study in 2003 (the final report was completed in September) to determine whether portions of the Stehekin Valley Road between MP 4.0 and MP 9.15 should be repaired and paved (the project portion of the Stehekin Valley Road is currently a gravel road) in place or rerouted away from the Stehekin River in specific problem areas. The study also included an initial evaluation of best practices for riverbank protection and stabilization, and an initial evaluation of pavement options. An important focus of the VA was on ways to avoid impacts to the Stehekin River. The analysis resulted in combining elements from several of the VA alternatives to form a preferred alternative.

A record 500-year flood event occurred in October of 2003 and caused significant damage to the road, which included washing out segments of the road at MP 7.0 and 7.5. This created the need for emergency road repairs (a reroute at MP 7.0 has been constructed and the road grade was raised between MP 6.7 and MP 7.0), which immediately reestablished 4x4 vehicle access to critical residences and facilities. The flood made it necessary to re-evaluate the alternatives and redesign the work that had occurred to date.

A field investigation and plan review meeting took place in April of 2004. The assumptions made in the earlier VA were revisited and verified. Several of the alternatives in the original VA were no longer valid as they proposed improvements to the existing roadway, which no longer existed. An additional VA was completed in June 2004 with revisions to the alternatives. For example, the present preferred alternative (Alternative 2) combines the 2003 VA best value alternative with several post-flood adjustments.

During the initial stages of preparation of the EA, resource surveys were conducted and it was discovered that there might be an active northern spotted owl nest in the vicinity of the project. Thus, NPS staff developed two additional alternatives that would not move the road in specific areas (one alternative had no road reroutes at either MP 7.0 or MP 7.5, this alternative has since been dismissed – see Alternatives Considered but Dismissed section – the other alternative is being carried forward in this EA as Alternative 4).

ALTERNATIVE 1 – NO ACTION

Implementing the No Action Alternative would result in the continuation of the existing conditions along the Stehekin Valley Road. These conditions include periodic flooding of the road, road closures, and the loss of vehicle access to properties along the road corridor, as well as loss of access to the upper Stehekin Valley and the interior of the Lake Chelan NRA and NOCA. There would also be ongoing uncontrolled erosion of the road, particularly during flood events, which could increase sediment loading into the Stehekin River depending on the location of the road erosion. While there would be no major planned road improvements, flood damage could result in the need to make major emergency repairs to keep the road open and operational. Otherwise, ongoing maintenance and repair of the roadway would occur as needed. This work would include placing gravel on the roadway and minor road grading. Under this

alternative, there would be no work in the Stehekin River such as constructing rock stream barbs to direct the river away from the road or any road/slope stabilizing structures or measures such as rock riprap/revetments. It is likely that continued flooding would impact the stability of the roadway and road operations. Thus, there would be an ongoing need to make emergency road repairs to keep the road operational.

ALTERNATIVE 2 – PREFERRED ALTERNATIVE

Alternative 2 is the agency-preferred alternative to address the need for improving road safety and the reliability of the road in the face of continued flooding and drainage problems. The preferred alternative proposes to construct a series of road, drainage, and bioengineered riverbank improvements (Figure 3) over approximately 5.15 miles of the Stehekin Valley Road. The majority of the road improvements would occur within the existing alignment, except for smaller sections that require special attention (i.e., to repair flood damage, and fix sight distance restrictions and drainage problems). The road would be rehabilitated as a single-lane road approximately 14 ft in width with appropriately spaced turnouts for two-way traffic. Approximately 20 pullouts would be constructed to improve visibility along the roadway corridor. The pullouts would be approximately 18 ft wide and 30-35 ft in length. Figure 4 shows the typical cross section of the road and the cross section of the road with pullouts.

In some areas the road grade would be raised to allow road operations to continue even with minor flooding and there are several road sections that would be repaired where there has been flood damage (Figure 5). Drainage improvements include approximately 18 culverts that would be added, replaced, or repaired and approximately 3,085 linear ft of ditches that would be constructed along the roadway (ditching along the road would be minimized as much as practical to protect resources). There would also be two road reroutes at MP 7.0 and MP 7.5. A typical cross section for the road reroute areas is shown in Figure 5.

The majority of the clearing for the project would range from 18-25 ft in width to minimize removal and disturbance of vegetation. In areas where new drainage ditches would be constructed along the sides of the existing road the clearing would range from 18-33 ft and in the road reroute areas clearing will range from 25-40 ft. However, as much as practical, the clearing limits will be minimized. An example of minimizing the amount of area to be cleared is described as follows for the road reroute at MP 7.0: the majority of the 1,000 ft reroute (approximately 500 ft) would be cleared to 25 ft, and approximately 300 ft would be cleared to 36 ft, 200 ft to 36-39 ft, and 100 ft to 40 ft.

For the two road reroute areas, approximately 2.8 acres would be cleared. Approximately 0.29 acres of clearing would result from constructing the 20 road turnouts (18 ft x 35 ft x 20 turnouts), and approximately 0.3 acres would be cleared for the turnaround at MP 9.15 (a portion of this area is already cleared).

Clearing limits along the remainder of the existing road would vary considerably depending on location, but a conservative estimate assuming an average clearing limit of 26 ft minus the existing road width and surrounding cleared area of approximately 14 ft gives a cleared area of 12 additional feet for a distance of 4.45 miles. This would result in approximately 6.5 acres of clearing (Note: This is a very conservative estimate, it is likely that clearing would not come close to this amount.). Thus, the total land disturbance (adding together the cleared areas from the reroutes, turnouts, turnaround, and the area outside the existing cleared area along most of the road) would be approximately 10 acres. Approximately, 1.8 acres of abandoned road would be obliterated and revegetated.

Approximately 5.15 miles of road would be paved with asphalt, which would tie into the existing pavement end at Harlequin Bridge (MP 4.0) and extend to the northern terminus turnaround (MP 9.15). Paving the road would reduce the need for gravel to maintain the road, reduce dust, minimize eroded sediment from the road being transported into the river, and facilitate snowplowing operations to keep the road open during the winter (paving was considered primarily to reduce maintenance costs after heavy rains and floods). Construction is planned for late summer or early fall 2005.

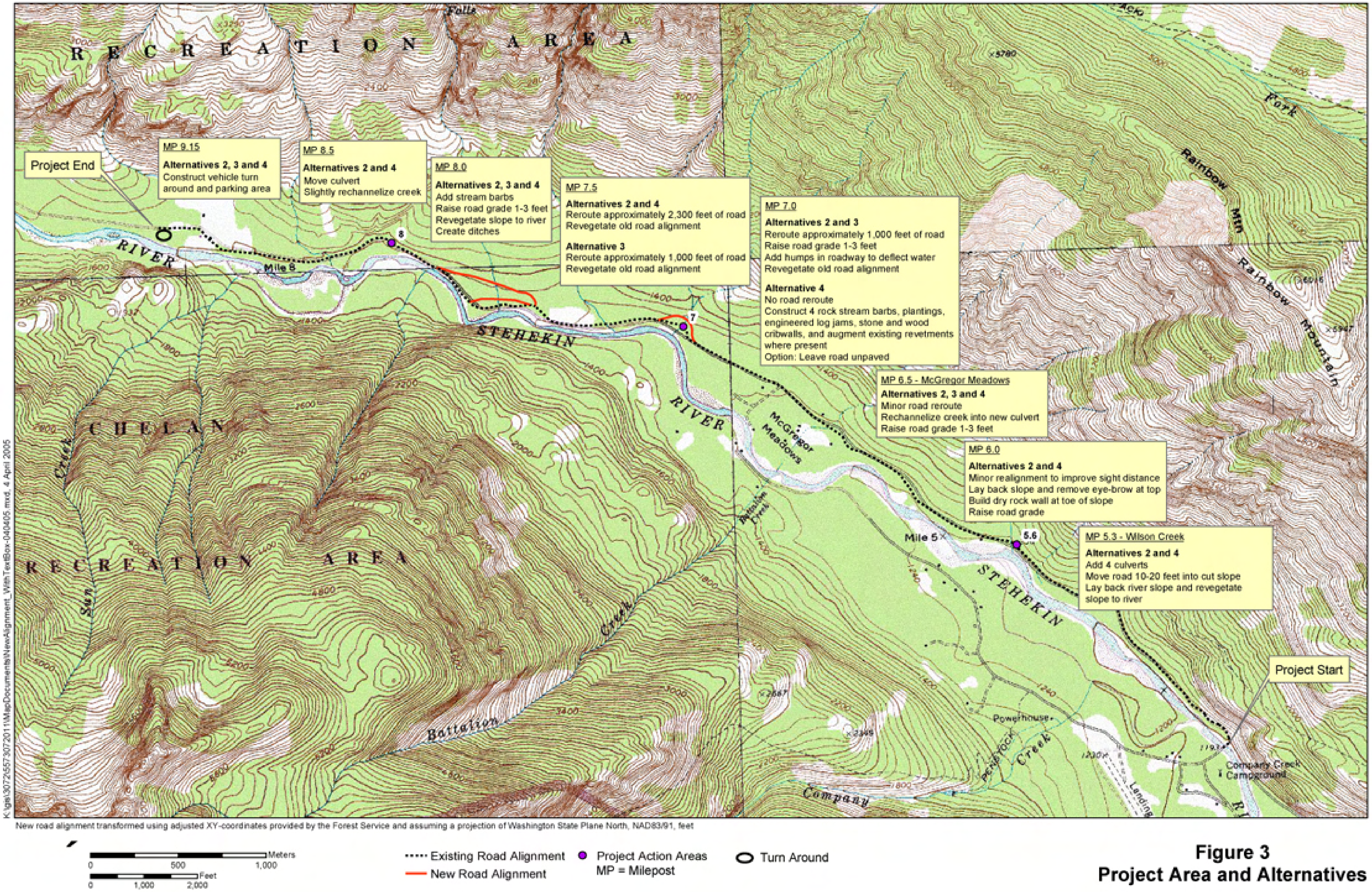
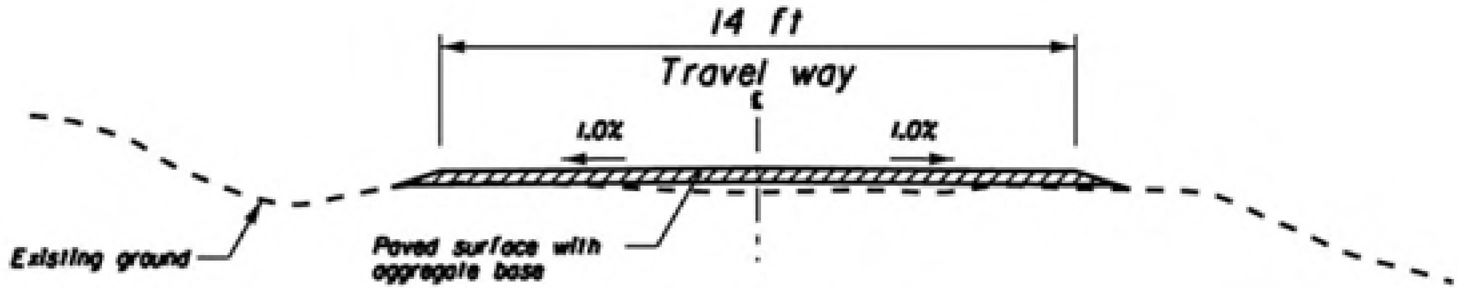
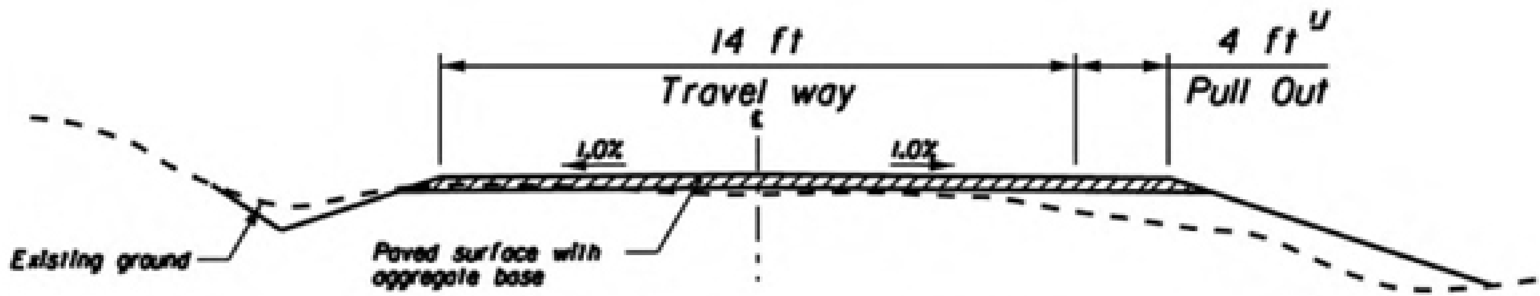


Figure 3
Project Area and Alternatives



TYPICAL SECTION



TYPICAL SECTION WITH PULL OUT

Figure 4
Typical Cross Section and Cross Section With Pullout

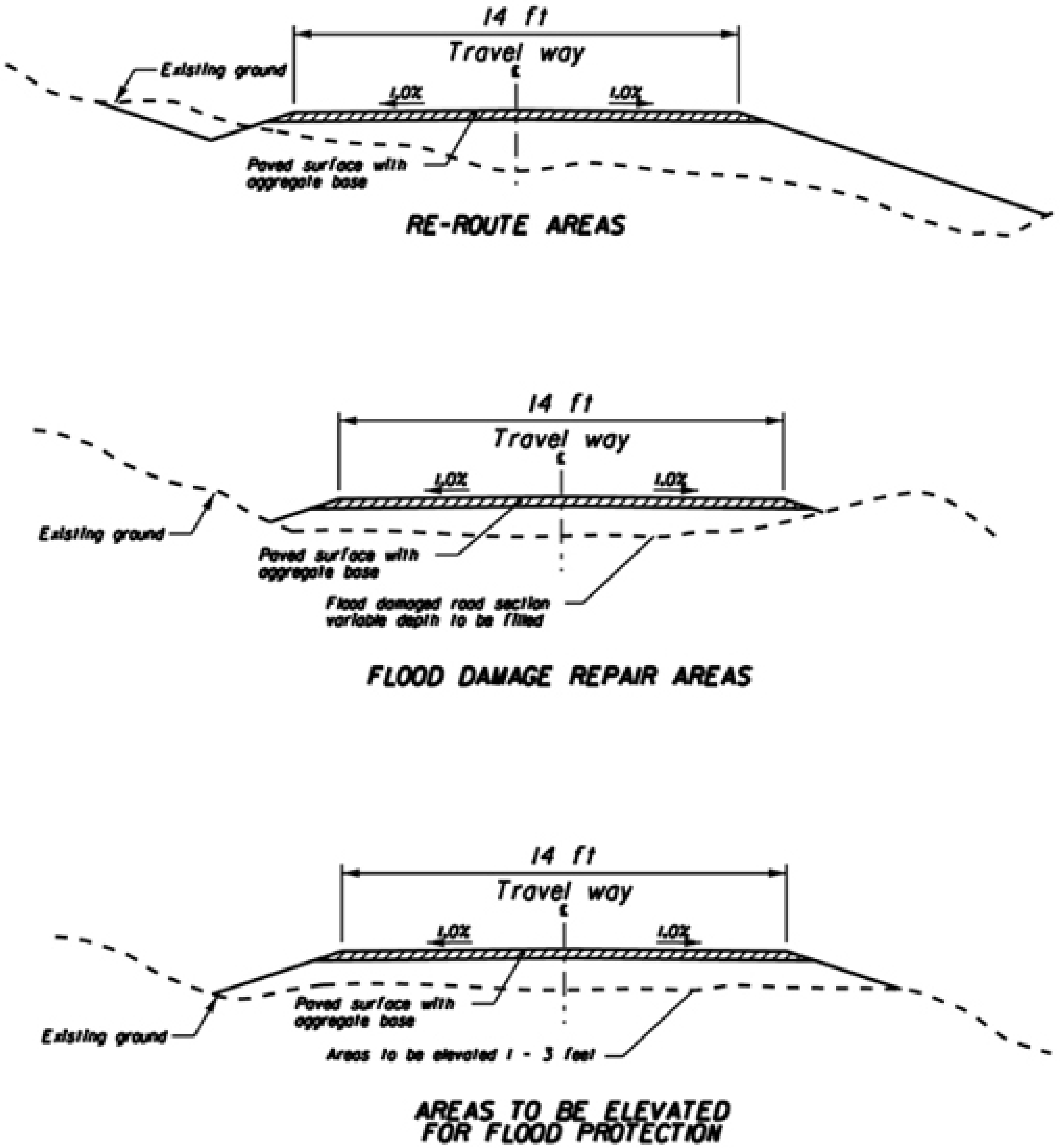


Figure 5
Typical Cross Sections for Road Reroutes, Flood Damage Repair and Elevated Road Sections

In terms of impervious surface, the existing road from Harlequin Bridge to MP 9.15 consists of approximately 8.9 acres of impervious surface (gravel roads are considered impervious surface). There will be some narrowing of portions of the existing road surface and obliteration of road sections in the reroute areas. This reduces the impervious surface by approximately 0.55 acres. However, new impervious surface includes approximately 0.76 acres for the new road reroutes and road pullouts, and approximately 0.8 acres for the parking area/turnaround. Thus, there will be an overall net increase in impervious surface of approximately 1 acre.

Most of the material to be used in the road construction including base course for the road subbase, aggregate material, and rock would be barged into Stehekin in accordance with the Lake Chelan NRA GMP. There may be gravel material taken from the park pit (Company Creek Pit) to repair some of the flood-related damage area. However, any use of material from the Company Creek Pit would be in compliance with the Lake Chelan Sand, Rock, and Gravel Plan, which specifically defines when and for what uses this material may be used. Any material brought in would be from an approved site that has been evaluated for the presence of exotic plants or noxious weeds (the desired material being absent of any exotics or noxious weeds). (Note: The fill amounts estimated in this section are approximate and additional imported material [over what was estimated] may be required to complete the project.)

Construction would also require several staging areas. Potential locations for the staging areas would be at the locations of the road reroutes. The older segments of road that would be abandoned may be used as the staging areas. Thus, staging areas could be located at MP 7.0 and between MP 7.5 and MP 8.0.

Traveling from south to north, the main improvement areas are proposed at the following locations: Wilson Creek (MP 5.3), MP 6.0, McGregor Meadows (MP 6.5), MP 7.0, MP 7.5, MP 8.0, MP 8.5, and MP 9.15 (Figure 3). These are described in more detail below. Road improvements planned at MP 6.0, MP 8.5, and MP 9.15 are not flood related. Improvements related to the October 2003 flood are planned at the remaining locations.

MP 5.3 - Wilson Creek

At Wilson Creek there are problems on both sides of the Stehekin Valley Road. On the south side, the Stehekin River has eroded the bank along the toe of the road slope and there is currently an approximate 20-foot steep drop with slopes of over 40 percent from the road to the river. During a recent site visit (February 2004), cracks were observed that had developed along the side of the road shoulder indicating the potential for future slope failure. Should this occur, portions of the road shoulder or the road itself could fail.

Wilson Creek is located on the northern side of the road, and is prone to periodic high flows. During these high flow periods, the creek deposits large quantities of sediment onto the road. It also tends to jump its bank during these events, and spreads out across the slope causing water to flow across the road in several places. This results in erosion to the road surface and additional sediment load to the Stehekin River.

Riverbank improvements proposed at this location include laying back the riverbank slope above the waterline for approximately 400 ft (approximately 1,100 yds^3 of cut and 1,250 yds^3 of fill) and stabilizing the slope with riprap (approximately 100-200 yds^3 of small boulders) and logs (e.g., a live crib wall) to allow native vegetation to be re-established (Figure 6).

The roadway would be adjusted to the northeast by cutting into the slope and moving the road 10-20 ft into the cut. Visual analysis indicated that no large trees or vegetation of concern would be lost through this action. The road grade would also be adjusted to smooth out the horizontal alignment. The roadwork would involve approximately 525 yds^3 of cut and 575 yds^3 of fill. These road adjustments would be made to move the road farther from the river and to allow the shoreline room to adjust naturally. This work is recognized as an approximately 10-15 year solution because erosion from the river is occurring at the toe of the slope and at some point in the future this issue will need to be addressed again.

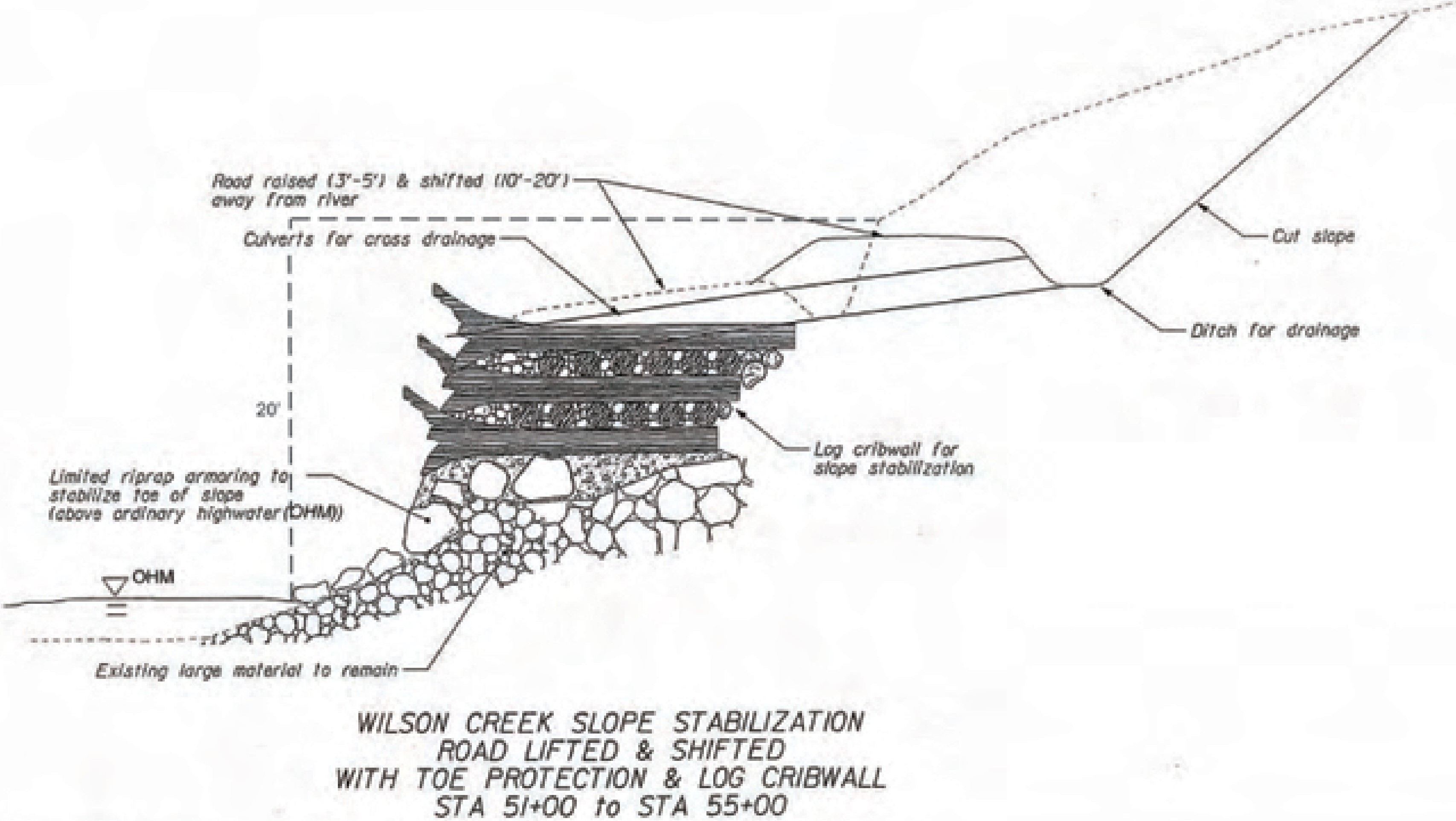


Figure 6
Wilson Creek
Slope Stabilization Action Area
(Alternatives 2 and 4)

Three additional culverts will also be installed across the road to reduce damage from heavy rains and flooding caused by Wilson Creek. The culverts will vary in size from 24 to 36 inches. Thus, there will be four evenly spaced culverts along the roadway (three new culverts and one existing culvert). A ditch would be constructed on the uphill side of the road to capture water from Wilson Creek and direct it to the culverts to keep the water from overrunning the road surface.

MP 6.0

Several improvements are proposed for this area and may be constructed as funding becomes available. At approximately MP 6.0, the slope above the road may be laid back and a protruding "eye-brow" of material removed to lessen the potential for material to slough off the slope onto the road. The soil is very fine on the slope and re-vegetation of the slope may require covering the slope with fallen trees, duff, and litter. A dry rock wall would be constructed at the toe of the slope to collect any material sliding off the slope. In addition the road grade may be raised to improve the access to private property. Between MP 6.0 and 6.5 there will be a minor realignment of the road away from the river to improve sight distance.

MP 6.5 – McGregor Meadows

The road grade in the vicinity of McGregor Meadows (from approximately MP 6.3 to MP 6.7) would be raised 1-3 ft to its former grade to help prevent flooding of the road surface (the road grade has already been raised 1-3 ft from MP 6.7 to MP 7.0 as part of the emergency road repair work related to the October 2003 flood). This would require approximately 5,200 yds^3 of gravel. Raising the road grade would also allow ditches to be re-created to help direct water away from the road surface. Where fill is proposed to raise the road, fill slopes would be kept as steep as possible to minimize the disturbance footprint. Minor reroutes would also be considered to improve limited sight distances.

MP 7.0

At MP 7.0, the road would be rerouted to the north and result in a new road section approximately 1,000 ft in length (an emergency road reroute has already been constructed because of the October 2003 flood that destroyed this road section - the permanent reroute would generally follow this temporary road, but would be moved farther away from the river). The initial by-pass work is scheduled for late summer/early fall of 2005 (following the end of the nesting season for spotted owls). It is estimated that this work would require 250 yds^3 of cut and 2,350 yds^3 of fill. This would disturb approximately 1.03 acres. The old road alignment has been abandoned and will be obliterated and revegetated. The abandoned road section may be used as a construction staging area prior to returning this road segment to a natural revegetated condition.

The road grade would be raised 1-3 ft and a series of rock-core humps or high points would be added in the roadway to prevent floodwaters from running down the road (fill slopes would be kept as steep as possible to minimize the disturbance footprint). In the past, floodwaters have run down the road because it is the path of least resistance and resulted in damage to the road. These actions will help to prevent the Stehekin River from following a new course down the road prism.

MP 7.5

At approximately MP 7.5 the road would be rerouted to the north to move the road farther away from the Stehekin River. This new road section would be approximately 2,300 ft in length and disturb approximately 2.37 acres. The approximate amount of cut and fill would be 1,400 yds^3 and 2,140 yds^3, respectively. The former road would be obliterated and revegetated (the former road may be used as a staging area prior to returning it to a natural state).

MP 8.0

At approximately MP 8.0, the existing streambank revetment may be repaired and reinforced. Two to four new stream barbs would be constructed in the river downstream of the two existing barbs. Existing barbs held up well during the last flood, but it was determined that more were needed to adequately protect this reach of the road from the river downstream from the existing barbs (river realignment during the October 2003 flood caused damage to a 600-foot section of road). The barbs are made up of large rocks that protrude into the river (Figure 7). They are designed to dissipate the force of the current and create eddies, thereby reducing bank erosion. They would protrude into the river approximately 20 percent of the width of the channel (about 10 ft) and be anchored into the existing roadbed. The barbs would be spaced approximately 300 to 400 ft apart and consist of approximately 250 - 400 yds^3 of material. The road grade would also be raised in this area 1-3 ft and a ditch established. No work would be performed on the cut slope above the road. Approximately 500 ft of the river slope would be revegetated.

As part of the in-stream work at MP 8.0 and in other areas such as Wilson Creek, bioengineering techniques will be used. An example of a bioengineering technique is the use of willow layering. This technique involves augmenting the soil and planting willows in layers next to and on the riverbank. Planting willows in layers provides several benefits. First, the willow layers protect and stabilize the riverbank. Secondly, willows provide woody debris (which is an important component for aquatic habitat) and shading to help maintain cooler temperatures. And, finally, they provide habitat for upland wildlife such as small mammals and amphibians.

MP 8.5

A creek is located near the Stehekin Valley Ranch that hits the road at a right angle, turns and flows east parallel to the road in a man-made ditch, and then is forced by boulders to turn 90 degrees into a culvert. Because of the angle that the creek meets the road, erosion is occurring along the road edge. Under this alternative, the culvert would be moved and the creek slightly channelized, so the creek and culvert line up and direct water under the road without impacting the road shoulder or road base.

MP 9.15

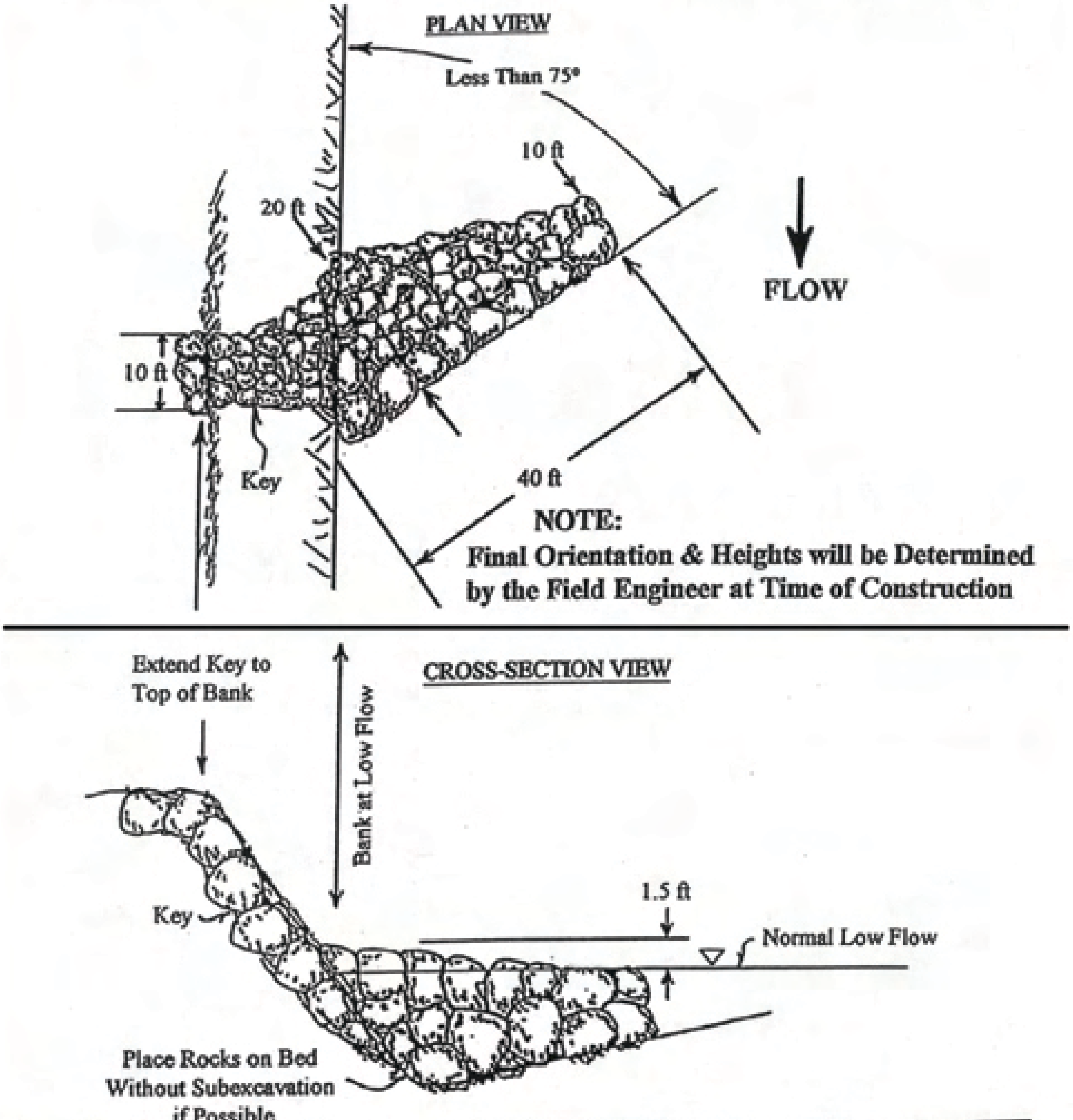
At MP 9.15, a vehicle turnaround and parking area would be constructed. The turnaround area would be approximately 0.8 acres in size and large enough to enable buses to turn without backing up. Parking would be provided for approximately 10 vehicles (or one bus and 5 vehicles). The turnaround would also be the northern extent for snow plowing operations along the road and would provide room to pile snow up.

Cost

The per mile cost of construction for the roadway work is approximately $726,250 per mile. The total construction cost of Alternative 2 is approximately $4,276,600.

BARB CONSTRUCTION DETAIL

STEHEKIN RIVER
NATIONAL PARK SERVICE



ROCK SPECIFICATIONS

% Larger Than	Effective Diameter	Weight
25%	4 ft	5000 lb
50%	3 ft	2000 lb
85%	2 ft	600 lb
95%	1 ft	80 lb

ROCK VOLUME
Per Structure
200 cu. yds.

NOTE: Willow cuttings to be planted in keys during construction.

Figure 7
Typical Rock Stream Barb

ALTERNATIVE 3 – MINOR IMPROVEMENTS

Alternative 3 is similar in some respects to Alternative 2, but the main difference is that it is reduced in the level of improvements that would take place (this alternative was identified as Alternative C in the 2003 VA analysis). Under this alternative, the Stehekin Valley Road would be paved from MP 4.0 to MP 9.15 with asphalt and there would be turnouts similar in number and location to those described for Alternative 2. However, improvements would only occur at five of the main locations instead of the eight locations listed in Alternative 2 (see Figure 3). These include work at MP 6.5, MP 7.0, MP 7.5, MP 8.0, and MP 9.15. There are no improvements proposed at Wilson Creek (MP 5.3), MP 6.0, or MP 8.5 under this alternative.

In terms of the amount of area that would be cleared, the cleared area would be similar to Alternative 2, except in the area of the reroute at MP 7.5. At this location the cleared area would be approximately 2 acres (as compared to 2.8 acres for Alternative 2), because of a shorter road reroute (1,000 ft vs. 2,300 ft) at MP 7.5. Overall, the new cleared area under this alternative would be approximately 9 acres. The amount of impervious surface under this alternative would be slightly less (approximately 0.36 acres less) than Alternative 2 because of the shorter reroute at MP 7.5. The improvements proposed at specific locations are described below.

MP 6.5 - McGregor Meadows

In the vicinity of McGregor Meadows (from approximately MP 6.3 to MP 6.7) the road would be raised 1-3 ft to its former grade (with 5,200 yds^3 of fill) to help prevent flooding of the road surface (the road grade has already been raised 1-3 ft from MP 6.7 to MP 7.0 as part of the emergency road repair). This would raise the road grade above the level of minor flooding.

MP 7.0

At MP 7.0 the road would be rerouted to the north. This new road section would be 1,000 ft in length and disturb approximately 1.03 acre. It is estimated that this work would require 250 yds^3 of cut and 2,350 yds^3 of fill. The road grade would be raised 1-3 ft and a series of rock-core humps or high points would be added in the roadway to prevent floodwaters from running down the road. The old road alignment has been abandoned and will be obliterated and revegetated (the former road may be used as a staging area prior to returning it to a natural state).

MP 7.5

At MP 7.5 the road would be rerouted to the north. This new road section would be 1,000 ft in length and disturb approximately 1.03 acre. It is estimated that this work would require 600 yds^3 of cut and 950 yds^3 of fill. The former road would be obliterated and revegetated (the former road may be used as a staging area prior to returning it to a natural state).

MP 8.0

At approximately MP 8.0, two to four new rock stream barbs would be constructed in the river similar to Alternative 2.

MP 9.15

At MP 9.15, a vehicle turnaround and parking area would be constructed similar to Alternative 2.

Cost

The per mile cost of construction for the roadway work is approximately $726,250 per mile. The total construction cost of Alternative 3 is approximately $4,231,875.

ALTERNATIVE 4 – REROUTE AT MP 7.5

Alternative 4 would have the same improvements as Alternative 2 at MP 5.3, 6.0, 6.5, 7.5, 8.0, 8.5, and 9.15 (see Figure 3). However this alternative differs from Alternative 2, because it would maintain the Stehekin Valley Road in its present alignment at the MP 7.0 location and there would be no road reroute in this location (Note: An emergency reroute was already constructed because the October 2003 flood washed away this section of roadway). This would reduce the amount of terrestrial habitat loss and reduce the level of terrestrial habitat fragmentation. This alternative would result in clearing approximately 8 acres. Instead of a road reroute, improvements would be made to the riverbank at MP 7.0 to prevent or reduce erosion of the riverbank. This would help protect the road from failure and preserve wildlife habitat.

The riverbank at MP 7.0 is eroding rapidly, and NPS relocated the road a short distance away from the river following the October 2003 flood. However, because of the rapid rate of riverbank erosion, it is likely that the relocated road section would be threatened within a few years. The length of eroding shoreline is 825 ft, with a 6-foot high bank composed of gravel that is more erodable compared to other areas such as the riverbank at MP 7.5.

To control and minimize further erosion, 4 rock stream barbs would be constructed in combination with bioengineering (engineered log jams – essentially the engineered log jams are constructed over and between the rock barbs and above the ordinary high water mark, thus the log jams only affect the river during flooding) and a short setback of the road to allow for a more stable bank slope (Figure 8). Some additional armoring of the toe of the slope between barbs would be required because of loose gravel bank material. This would require approximately 775 yds^3 of large angular rock. Large woody debris would be incorporated into the rock structures and bioengineering (i.e., willow layering) would be used along the upper portion of the barbs.

One option that is also being considered is to leave the road unpaved through this area. Because of the rapid rate of erosion, it could be necessary to move the road again in the near future or to take additional measures to harden the bank to protect a paved road section. It is not desirable to harden more riverbank in this area, because there are already large areas of riverbank above and below this section that have been hardened, and any large-scale bank stabilization in this area could constitute a major impact. Leaving the road unpaved would make it easier to move the road in the future, as well as slightly reducing the cost of improving the road (i.e., paving).

Cost

The per mile cost of construction for the roadway work is approximately $726,250 per mile. The total construction cost of Alternative 4 is approximately $4,097,685.

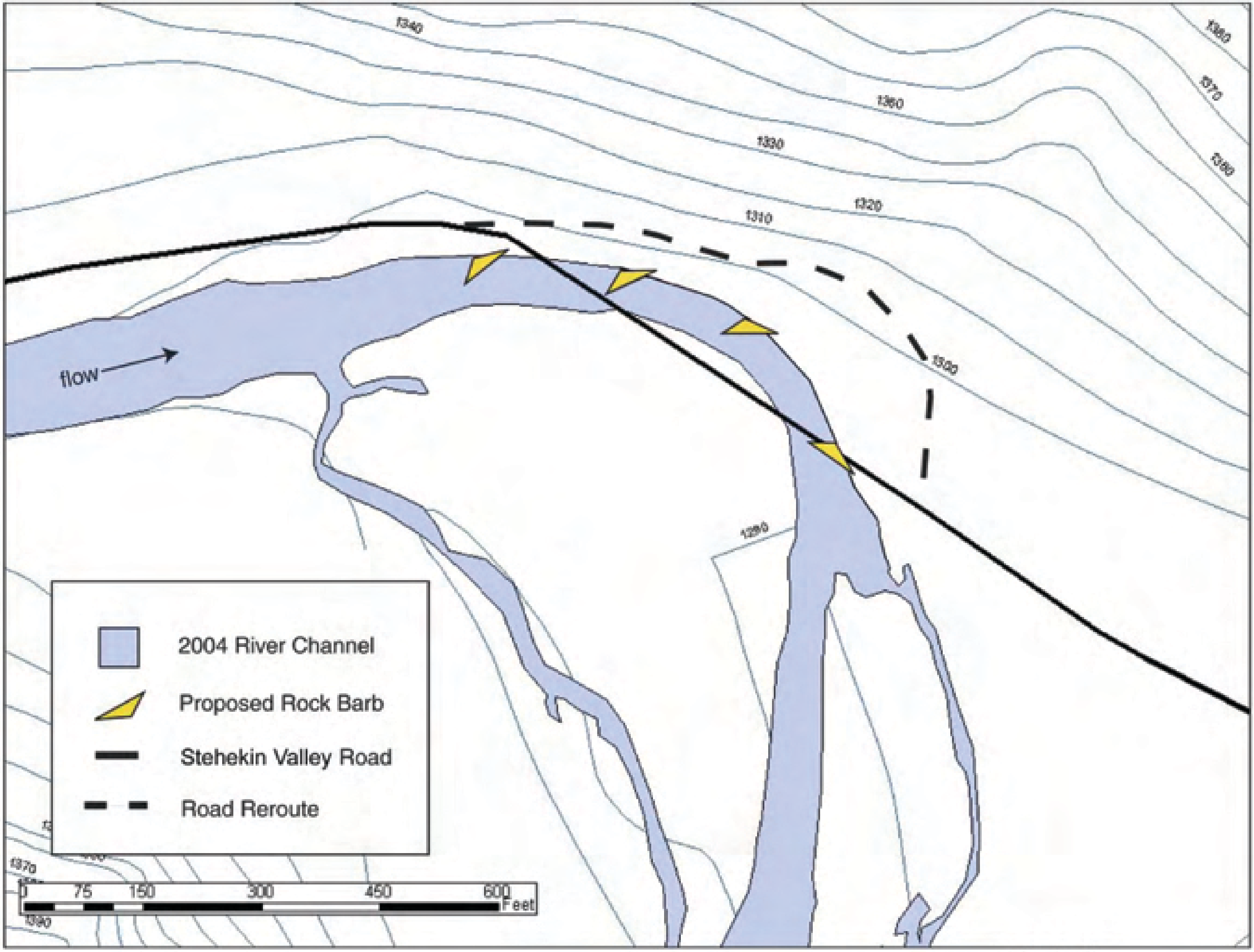


Figure 8
Erosion Control MP 7.0
(Alternative 4)

ALTERNATIVES CONSIDERED BUT DISMISSED

The original Value Analysis for the Stehekin Valley Road considered 5 alternatives. The alternatives that were considered in the VA included: Alternative A – a major reroute at two locations (1.6 miles of reroute); Alternative B – a total reroute out of the 25-year floodplain (2.6 miles of reroute); Alternative C – minor reroutes at MP 7.0 and MP 7.5 and raising the road at McGregor Meadows; Alternative D – existing alignment with erosion site augmentation; and Alternative E – minimal improvements and paving.

As stated previously, Alternative 2 (preferred alternative) is a hybrid of the elements of several of the alternatives addressed in the VA study (Alternatives C and D with additional work at Wilson Creek). Alternative 3 in this EA was Alternative C in the VA study.

The VA alternatives considered but dismissed from analysis in this EA were eliminated for one or more of the following reasons:

- The alternative's lack of technical feasibility
- Inability to meet the project's purpose and need
- Duplication with other less environmentally damaging or less expensive alternatives
- Conflict with an up-to-date park plan, statement of purpose and significance, or other policy
- Severe environmental impact
- As a secondary supporting reason, economic infeasibility.

Based on the evaluation of the factors listed above and a comparison of the relative advantages including costs, it was decided that a hybrid alternative of Alternatives C and D would best meet the purpose and need of the project. Alternative C was also forwarded for analysis in this EA, as it was the next best alternative for meeting the purposes of the project. Alternatives A and B were dismissed because of the potential for an unacceptable level of adverse impact on northern spotted owls. Alternative E was dismissed because it did not meet the project purpose and need (such as improving safety and the stability of the roadway).

Two additional alternatives were developed to eliminate one or both of the road-reroutes to minimize clearing and reduce the impact on threatened and endangered species (northern spotted owls). Alternative 4, which proposes to eliminate the road reroute at MP 7.0, is being carried forward in this EA. The other alternative was to eliminate the road reroutes at both MP 7.0 and MP 7.5 (no road reroute alternative).

The no road reroute alternative proposed to make shoreline improvements instead of rerouting the road to stabilize the riverbank that supports the road. During the development of this alternative, two shoreline improvement options were considered. One option was to place rock riprap along entire sections of riverbank that are prone to erosion. The other option was to construct rock stream barbs with bioengineering similar to what is proposed in Alternative 4 (except that rock stream barbs and bioengineering would be used at both MP 7.0 and MP 7.5).

Under the rock riprap option, creation of a rock revetment (blanket) that was roughly 825 ft long, 9 ft tall (included 3 ft below the ordinary high water mark [OHW]) and 3 ft thick would have resulted in placement of approximately 825 yds^3 of rock riprap at MP 7.0. At MP 7.5, this would have required creation of a rock revetment that was roughly 600 ft long, 17 ft tall and 3 ft thick. This would have resulted in placement of approximately 1,200 yds^3 of rock riprap.

The riprap option was considered but rejected for several reasons: (1) Riprap is known to have substantial adverse impacts to riparian areas and stream banks, (2) Riprap is very costly, because rock has to be imported into the Stehekin valley, (3) This would have caused an increase in the percent of riverbank modification (channelization of the river) – in the 3 stream reaches affected by the project (the percent of existing riverbank modification ranges from 31% to 73%), (4) It increases the uncertainty of downstream impacts – deflecting stream flow can result in the erosion problem being worse downstream, and (5) The GMP and NPS management direction is to avoid hard armoring of the riverbank with riprap. NPS has successfully avoided use of large amounts of riprap in favor of using rock barbs, large wood, and bioengineering.

The other option was to use bioengineering and streambank stabilization measures instead of road reroutes at MP 7.0 and MP 7.5. This option and the alternative was dismissed because it would result in additional streambank hardening in the river reach and not meet the GMP goal of maintaining the river in its natural state as much as possible.

MITIGATION MEASURES OF THE ACTION ALTERNATIVES

The NPS places a strong emphasis on avoiding, minimizing, and mitigating potentially adverse environmental impacts. To help ensure the protection of natural and cultural resources and the quality of the visitor experience, the following protective measures would be implemented as part of the action alternatives. The NPS would implement an appropriate level of monitoring throughout the construction process to help ensure that protective measures are being properly implemented and to achieve the intended results.

Soils

Mitigation measures for adverse impacts to soils include:

- Clearly delineate clearing limits to minimize the amount of cleared area.
- Clear and grub only those areas necessary for construction.
- Reuse topsoil duff from the reroute areas to rehabilitate the obliterated road sections.

Water Quality

The following conservation (mitigation) measures were taken from the Biological Opinion produced by the U.S. Fish and Wildlife Service for the project. Best Management Practices to control erosion and sedimentation shall be implemented, including the following:

- The area to be cleared will be clearly marked on the ground to minimize the amount of cleared area.
- Only those areas necessary for construction will be cleared.
- Topsoil duff from the reroute areas will be used to rehabilitate (re-create habitat) the obliterated road segments.
- The amount of disturbed earth area and the duration of soil exposure to rainfall will be minimized.
- Erosion-containment controls such as silt fencing and sediment traps (e.g., check dams and hay bales) will be used to contain sediment on site.
- Temporary diversion devices such as culverts, and trenches, or French drains will be used to direct surface water away from exposed slopes.

- Slopes will be scarified, if necessary, to slow erosion.
- Storm water will be directed away from disturbed areas into temporary settling basins.
- Disturbed soil will be covered with plastic sheeting, jute matting, erosion netting, straw, or other suitable cover material.
- Disturbed earth will be revegetated with non-exotic plants as soon as practical.
- Staging and stockpiling areas will be located away from the Stehekin River and these areas will be delineated with temporary fencing or tape to prevent incremental expansion of the staging area.

Best Management Practices to control adverse impacts of fuel spills shall be implemented, including the following:

- Refueling activities will be done at least 100 feet from the river and its tributaries.
- Areas where refueling or maintenance of equipment will be done will be identified and will have containment devices such as temporary earth berms surrounding these areas.
- Absorbent pads will be available to clean up spills.
- Contract specifications will include restrictions on the location of fueling sites, requirements for spill containment, and other measures to safeguard aquatic and terrestrial habitat from construction-related contaminants.

Stream Flow Characteristics

The duration of the in-stream work would be limited as much as possible. Work would be timed to occur at lower flow periods (i.e., work would not occur during heavy river flows) and avoid fish spawning periods. Paving (creation of impervious surface) would also be minimized as much as possible, for example road shoulders would not be paved.

Vegetation

Mitigation measures for minimizing vegetation disturbance and replacing lost vegetation include:

- Obliterate and revegetate abandoned road segments and areas disturbed by construction with native plant species.
- Use bioengineering techniques such as willow layering to stabilize slopes.
- Minimize the area to be cleared.

Mitigation measures for preventing the spread of noxious weeds include:

- Only freshly exposed subsurface materials would be imported from the quarry outside the park. No stockpiled materials from the quarry would be used.
- Material removed from the offsite quarry would be covered while being transported into the Lake Chelan NRA.
- All vehicles having contact with soil or materials that may contain noxious weed seed would be washed prior to working in weed free areas or transporting weed free materials.
- Any soil or rock materials that would be stored would be covered to prevent exposure to noxious weed seed.

- Salvaged soil known to contain noxious weeds would be stored, covered, and separated form weed free soil. This material could be used for subsurface fill.

Wildlife and Threatened and Endangered Species

The following conservation (mitigation) measures related to northern spotted owls, bull trout, and other wildlife species were taken from the Biological Opinion produced by the U.S. Fish and Wildlife Service for the project:

- No construction activities will take place within the Action Area between March 1 (the beginning of the spotted owl nesting season) and September 6, depending on the age of the fledgling spotted owls, as follows: work can begin on or after September 6 as soon as at least 4 weeks have passed since fledging of the spotted owl(s), if any. This determination will be done by the North Cascades Complex wildlife biologist.
- Construction activities will be carried out only during daylight hours to minimize effects to spotted owls.
- No pullouts will be constructed within line-of-sight of the area along the road that is immediately adjacent to the current spotted owl nest tree.
- The placement of rock barbs will be done outside the wetted channel. The rock will be placed in the channel using heavy equipment that will be on the road or bank above the ordinary high water line.
- All garbage will be taken off-site at the end of each working day.

The following reasonable and prudent measures with respect to northern spotted owls (developed by the USFWS in the Biological Opinion) would be implemented as part of the project:

- Monitor project implementation to ensure compliance with the conservation measures listed above, especially the seasonal timing restrictions and the final placement of the road near the spotted owl nest. Report the results of this monitoring to the USFWS. A North Cascades Complex biologist is to monitor the spotted owl nest to determine if the spotted owls produce young during the year(s) of project implementation (*Note: The biologist would also determine whether the spotted owl nest is occupied or has moved*.). If they do discover young, then the biologist is to estimate the age of the fledgling(s) as part of the timing restrictions described above.
- The NPS shall report the progress of the proposed action and its impacts on Federally threatened and endangered species, particularly northern spotted owls to the USFWS as specified in the incidental take statement in the Biological Opinion in accordance with 50 CFR §13.45 and §18.27.
- Any dead or injured Federally-listed species found in the Action Area[1] shall be reported within 24 hours to a special agent of the USFWS, Division of Law Enforcement at (360) 753-7764, or to the USFWS Western Washington Fish and Wildlife office at (360) 753-9440. In addition, the USFWS is to be notified in writing within 3 working days of the accidental death of, or injury to, a northern spotted owl or of the finding of any dead or injured spotted owls during

[1] The Action Area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402). The Action Area is estimated only for those species for which adverse effects are anticipated, in this case, northern spotted owls. For this project, the Action Area is 1,000 feet in all directions from the owl nest tree.

implementation of the proposed Federal action. Notification must include the date, time, and location of the incident or discovery of a dead or injured spotted owl, as well as any pertinent information on circumstances surround the incident or discovery. The USFWS contact for this written information is the Manager for the Western Washington Fish and Wildlife office.

Visitor Experience

Mitigation measures for visitor experience include the following:

- A public information program to warn of construction related road closures, delays, and road hazards would be implemented. This program would help to aid in mitigating any impacts on visitor's expectations and experiences.

    - Notice should also be provided to equestrians (e.g., Stehekin Valley Ranch) because during construction hot asphalt could make the road temporarily impassable for horses crossing the road.

- Vehicle traffic would be managed within the construction zone and contractor hauling of materials, supplies, and equipment would be controlled to minimize disruptions in visitor traffic.
- A safety plan would be developed prior to the initiation of construction to ensure the safety of park visitors, workers, residents, and park staff.
- During construction, dust should be controlled (generally dust is controlled by minimizing soil disturbance, spraying water over disturbed soil areas during dry periods [no chemicals would be used to control dust], and revegetating disturbed soil areas as soon as practical following construction).

Park Operations

- Contractors would provide and maintain park staff and emergency vehicle access through the project area during construction and would coordinate all work with park staff to reduce disruption in normal park activities.
- Construction workers would be informed about the special sensitivity of park values and regulations.
- Park resource specialists would be involved in inspections and monitoring and provide recommendations during the road rehabilitation work.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The Council on Environmental Quality defines the environmentally preferred alternative as "…the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act §101." Section 101 states that, "…it is the continuing responsibility of the Federal Government to:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

4. Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment, which supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use, which will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

The selection of the "Environmentally Preferred Alternative" was based on an analysis, which balances factors such as physical impacts on various aspects of the environment, mitigation measures to deal with these impacts, and other factors including the statutory mission of the National Park Service and the purposes for the project.

Alternative 1 is not the environmentally preferred alternative for several reasons: (1) Implementing this alternative would not improve road safety, (2) Visitors and residents would continue to experience impacts from dust generation such as reduced air quality and visual impacts from dust coating the roadside vegetation, (3) The road would continue to require resource materials (i.e., gravel), and (4) There would likely be ongoing road closures from flood events making it more difficult for visitors and staff to access the park complex. Thus, it would not meet goals 2, 3, 5, or 6.

Alternative 2 is the environmentally preferred alternative. Implementing Alternative 2 would best preserve the natural aspects of the Stehekin River and its floodplain as compared to the other alternatives, because it removes more of the road away from eroding riverbanks, thus allowing the river to meander naturally and to maintain its natural erosion process (goals 1 and 4). Improving the road by raising the road grade and moving it out of the floodplain in several places would allow for more unimpeded access (i.e., less road closures due to flooding of the road surface) to the recreational opportunities in NOCA, Lake Chelan NRA, and the wilderness areas (goals 2, 3, and 5). It would also reduce the use of gravel for road repair and maintenance (goal 6). However, there would be some environmental tradeoffs associated with this alternative, particularly related to endangered species. Moving the road would benefit the river and recreational access, however, the road would be moved closer to wildlife habitat, which could adversely affect wildlife (goals 1, 3, and 4).

A case could be made for Alternative 3 as the environmentally preferred alternative because there would be fewer environmental impacts as compared to Alternative 2, such as less earth disturbance and vegetation removal (goal 4). However, Alternative 3 would not fix several safety problem areas as compared to Alternative 2 (goals 2, 3 and 5). For example, Alternative 3 would not stabilize the river/road bank in the area of Wilson Creek. Slope failure in this area could result in complete road closure, a decrease in the safety of using this portion of the road, and adverse impacts to the Stehekin River from sedimentation and increased turbidity. In addition, this alternative would not resolve the sight distance and slope instability problems at MP 6.0 or the erosion occurring along the road base from the stream at MP 8.0.

Alternative 4 involves riverbank modifications instead of a road reroute at MP 7.0. Building the riverbank improvements instead of a road reroute would reduce impacts to soils, vegetation, and terrestrial wildlife habitat (goals 1, 3, and 4). However, the riverbank improvements would result in impacts on floodplains, stream flow characteristics, and water quality. Thus, there are tradeoffs to consider between Alternative 4 and Alternative 2 that are dependent on what factors are deemed most important in terms of meeting federal responsibilities pertaining to the six goals mentioned above. Perhaps the most important factor to consider is that Alternative 4 does not help to meet the goal of preserving the natural aspects of the river (its ability to meander naturally), because it constrains the movement of the river (goal 3). While habitat is relatively common in the project area, the river is a key element of the environment. NPS goals outlined

in the Lake Chelan NRA GMP include preserving the ability of the river to meander above all else, except where necessary to maintain the road. Since it is possible to move the road away from the river and not impact the natural functions of the river, Alternative 2 better meets goals 1, 3, 4, and 5. Therefore Alternative 4 is not the environmentally preferred alternative.

COMPARATIVE SUMMARY OF THE ALTERNATIVES

Tables 1 and 2 provide a matrix summary of the alternatives. Table 1 describes the different actions and activities that would occur under each alternative and Table 2 summarizes the potential impacts of the alternatives.

Table 1. Comparative Summary of Alternatives

Alternative 1 **No Action**	**Alternative 2** **Preferred Alternative**	**Alternative 3** **Minor Improvements**	**Alternative 4** **No Reroute at MP 7.0**
There would be no major improvements to the Stehekin Valley Road unless emergency repairs are needed due to flood damage. Continued maintenance of the road would be needed and require placement of gravel and minor grading. Decreased road safety (i.e., poor sight distance, access problems, material sloughing onto the road, and potential failures of the road surface from erosion and flooding) would continue to be a problem and have adverse impacts on the effectiveness of the road to serve park staff and visitors.	A 5.15-mile segment of the Stehekin Valley Road would be rehabilitated and paved. A series of road and drainage improvements (18 culverts and 3,085 ft of ditches would be constructed) and erosion control features would be constructed. Approximately 20 pullouts would be constructed. Alternative 2 would result in clearing 10 acres and creation of 1 additional acre of impervious surface. Specific actions would occur at 8 locations (described below). At MP 5.3, the uphill slope would be cut back and the road moved 10-20 ft away from the Stehekin River. Ditches would be established and 3 culverts placed under the road. The riverbank would be laid back above the waterline and stabilized with rocks and logs and the riverbank would be revegetated. Approx. 1,625 yds^3 of cut and 1,825 yds^3 of fill would be required. At MP 6.0, the slope above the road would be laid back removing an overhang and revegetate slope. A rock wall would be constructed at the toe of the slope. Road may be shifted slightly and road grade raised. At MP 6.3-MP 6.7, the road grade would be raised 1-3 ft (5,200 yds^3 of fill) and ditches constructed. May also involve minor road alignment shifts. At MP 7.0, the road would be rerouted 1,000 ft (temporary route already established) and the road grade would be raised 1-3 ft (250 yds^3 of cut and 2,350 yds^3 of fill). Humps would be added in the road to deflect flood flows and old road alignment would be revegetated. At MP 7.5, the road would be rerouted 2,300 ft (1,400 yds^3 of cut and 2,140 yds^3 of fill) and the old road alignment would be revegetated. At MP 8.0, the road grade would be raised 1-3 ft. Construct 2-4 rock stream barbs (250 – 400 yds^3 of material). Revegetate slope to the river. At MP 8.5, move culvert and slightly rechannelize creek. At MP 9.15, construct parking area and turnaround. Construction cost for this alternative would be $4,276,600.	A 5.15-mile segment of the Stehekin Valley Road would be rehabilitated and paved. A series of road and drainage improvements and erosion control features would be constructed. Approximately 20 pullouts would be constructed. Alternative 3 would result in clearing 9 acres and creation of additional 0.64 acre of impervious surface. Specific actions would occur at 5 locations (described below). At MP 6.5, road grade would be raised 1-3 ft (5,200 yds^3 of fill) and ditches constructed. May also involve minor road alignment shifts. At MP 7.0, the road would be rerouted 1,000 ft and the road grade would be raised 1-3 ft (250 yds^3 of cut and 2,350 yds^3 of fill). Humps would be added in the road to deflect flood flows and old road alignment would be revegetated. At MP 7.5, the road would be rerouted 1,000 ft (600 yds^3 of cut and 950 yds^3 of fill) and the old road alignment would be revegetated. At MP 8.0, the road grade would be raised 1-3 ft. Construct 2-4 rock stream barbs (200 yds^3 of material). Revegetate slope to the river. May also reinforce and repair existing revetment. At MP 9.15, construct parking area and turnaround. Construction cost for this alternative would be $4,231,875.	A 5.15-mile segment of the Stehekin Valley Road would be rehabilitated and paved. A series of road and drainage improvements and erosion control features would be constructed. Approximately 20 pullouts would be constructed. Alternative 4 would result in clearing 8 acres and creation of 0.7 additional acre of impervious surface. Specific actions would occur at 8 locations (described below). Actions at MP 5.3, 6.0, 6.5, 7.5, 8.0, 8.5, and 9.15 would be similar to Alternative 2. At MP 7.0, there would be no road reroute. Instead 4 rock stream barbs would be constructed to protect 825 ft of shoreline. Rock armoring would be used at the toe of the slope between barbs. Approximately 775 yds^3 of rock would be needed. Large woody debris would be used in the barbs, as well as bioengineering (i.e., willow layering). Construction cost for this alternative would be $4,097,685.

Table 1. Comparative Summary of Alternatives (continued)

Alternative 1 No Action	Alternative 2 Preferred Alternative	Alternative 3 Minor Improvements	Alternative 4 No Reroute at MP 7.0
Meets Project Objectives? This alternative does not meet the purpose and need. The Lake Chelan NRA GMP calls for improving and paving this road section. There is also a need to protect the road from flooding and to improve safety on the roadway. Under this alternative none of these road improvement actions would occur.	**Meets Project Objectives?** This alternative meets the project purpose and need. It would improve road safety, repair the road and protect it from further flood damage, and preserve the natural condition of the floodplain by moving the road farther away from the river, thus allowing the river to meander naturally.	**Meets Project Objectives?** This alternative generally meets the project purpose and need (although not as thoroughly as Alternative 2). It would improve road safety and preserve the natural condition of the floodplain by moving the road farther from the river, thus allowing the river to meander naturally. It would also repair the road and protect it from further flood and erosion damage in most places. However, the road would still be susceptible to flooding at MP 5.3 from Wilson Creek and potential road failure from river erosion at the toe of the road slope, damage to the road base from erosion caused by the creek at MP 8.5, and sight distance problems and material sloughing onto the road at MP 6.0.	**Meets Project Objectives?** This alternative meets the project purpose and need. It would improve road safety, repair the road and protect it from further flood damage, as well as moving the road farther from the river, allowing the river to meander naturally (but only at one point instead of two as compared to Alternative 2). It would also help to preserve wildlife habitat, because there would be no road reroute at MP 7.0.

Table 2. Summary Comparison of Impacts

Impact Topic	Alternative 1 No Action	Alternative 2 Preferred Alternative	Alternative 3 Minor Improvements	Alternative 4 No Reroute at MP 7.0
Soils	Maintaining current conditions could cause long-term minor adverse impacts to soils; ongoing road maintenance and repair would be necessary involving placement of gravel and disturbance of soils; potential for widening of road prism over time reducing soil productivity.	Disturbance of 10 acres of soil, placement of structural fill, and paving would result in minor long-term adverse impacts on soil and soil productivity.	Disturbance of 9 acres of soil, placement of structural fill, and paving would result in minor long-term adverse impacts on soil and soil productivity.	Disturbance of 8 acres of soil placement of structural fill, and paving would result in minor long-term adverse impacts on soil and soil productivity.
Water Quality	Left unpaved, the road surface would continue to erode, resulting in ongoing maintenance and placement of additional gravel. Erosion of this road surface would continue to contribute minor amounts of sediment to the river. These short-term adverse impacts would be localized and minor.	Short-term effects to water quality could result from in-water work, earth disturbance, stockpiling of earth, and potential spills of materials such as oil or fuel during construction. Impacts from in-water work would be localized and minor, because work would be completed quickly, and stream flow would rapidly dissipate the sediment. Adverse impacts from earth disturbance, stockpiling, and spills of fuel or oil would be short-term and negligible with mitigation. Contaminants from the paved road surface are expected to have no adverse impacts. Overall, Alternative 2 would have short-term minor adverse impacts on water quality. Long-term beneficial effects would occur from paving the road, due to the decreased potential for impacts from erosion and sedimentation impacts.	Effects would be similar to those of Alternative 2. Short-term adverse impacts would be slightly less, due to differences at Wilson Creek and MP 6.0. Long-term benefits would be slightly less for these same areas. Alternative 3 would have short-term minor adverse impacts on water quality.	In-water work and road reroute would result in construction related impacts such as increased erosion and turbidity that are short-term and minor adverse impacts. Alternative 4 would also have benefits to water quality similar to Alternative 2, because riverbank improvements at MP 7.0 and 8.0 would reduce riverbank erosion.
Stream Flow Characteristics	There would be no changes in stream flow characteristics unless necessitated by emergency road repair. In those instances it may be necessary to construct in-water erosion control structures. Thus, this alternative would have a long-term, minor to moderate adverse impacts on stream flow.	Although run-off from paved road surface may impact peak flow volumes, these adverse impacts would be expected to be negligible, due to the very small percentage of impervious surface in the watershed. Placement of rock barbs could have a moderate long-term adverse impact on flow regime and channel forming processes. Moving the road away from the river (road reroutes) would benefit stream flow as it prevents the need for additional river control structures.	Similar to Alternative 2, Alternative 3 would have long-term moderate adverse impacts from adding rock barbs. There would be benefits to stream flow from moving road farther from the Stehekin River (although benefits would be slightly less than Alternative 2 because of shorter road reroute).	Similar to other alternatives, the construction of rock stream barbs would result in long-term moderate adverse impacts. Approximately 825 ft of shoreline would be affected by this alternative. Beneficial effects to stream flow would result from the road reroute at MP 7.5 because it would lessen the need for control structures in the river.

Table 2. Summary Comparison of Impacts (continued)

Impact Topic	Alternative 1 No Action	Alternative 2 Preferred Alternative	Alternative 3 Minor Improvements	Alternative 4 No Reroute at MP 7.0
Wild and Scenic Rivers	Alternative 1 would have long-term minor to moderate adverse impacts on the free-flowing characteristics of the Stehekin River. Alternative 1 would have varied impacts on the river's outstandingly remarkable values (ORVs). There would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have short-term moderate adverse impacts; short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.	Alternative 2 would have a long-term, moderate, adverse impact on the free-flowing characteristic of the Stehekin River. Regarding the impact on outstandingly remarkable values (ORVs), there would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, there would be: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.	Alternative 3 would have long-term, moderate, adverse impacts on the free-flowing characteristics of the Stehekin River. On the river's outstandingly remarkable values (ORVs), there would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, there would be: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.	Alternative 4 would have long-term, moderate, adverse impacts on the free-flowing characteristics of the Stehekin River. The impacts on the river's outstandingly remarkable values (ORVs) would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, there would be: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.
Floodplains	There would be no restriction of flood flows or changes in flood storage capacity unless necessitated by emergency road repair. In those instances fill may be needed within the floodplain. However, not expected to have more than a long-term, negligible adverse impact.	Long-term but minor adverse impacts caused by placing fill in the floodplain. Benefits to floodplain processes by moving road out of the 25-year floodplain.	Similar to Alternative 2. Long-term minor adverse impacts from placing fill and benefits from moving road (benefits would be slightly less than Alternative 2 because less of the road would be moved out of the floodplain).	Long-term minor adverse impacts caused by placing fill in the floodplain (mostly related to the stream barbs). Some benefit still gained because a portion of the road would be moved out of the 25-year floodplain.

Table 2. Summary Comparison of Impacts (continued)

Impact Topic	Alternative 1 No Action	Alternative 2 Preferred Alternative	Alternative 3 Minor Improvements	Alternative 4 No Reroute at MP 7.0
Vegetation	Short-term adverse minor impacts from road maintenance activities, which would disturb vegetation along the road edge. Potential long-term adverse minor impacts from emergency road repairs such as road reroutes that would result in loss and alteration of vegetation.	Clearing of 10 acres would produce long-term loss of vegetation. Some of the overstory vegetation such as Bigleaf maple and cottonwood is high value habitat for wildlife, which is a concern. Loss of vegetation would be long-term minor adverse impact. Short-term adverse impacts from construction would also be minor. These may include soil compaction, loss or alteration of vegetation (habitat), potential to increase spread of non-native plant species, and shift in plant composition for shady and sun tolerant plants. Benefits to vegetation would be achieved by replanting abandoned road sections and riverbank with native plant species.	Clearing of 9 acres would result in long-term minor adverse impact on vegetation. Short-term adverse impacts from construction would be similar to Alternative 2, although there is a slightly reduced effect because there would be a shorter road reroute at MP 7.5 and no work at MP 5.3 or MP 6.0. Benefits to vegetation would be achieved by replanting abandoned road sections and riverbank with native plant species.	Clearing of 8 acres would result in long-term minor adverse impact on vegetation. Short-term adverse impacts from construction would be similar to Alternative 2, although there is a slightly reduced effect because there would be no road reroute at MP 7.0. Greater benefits to vegetation from this alternative as compared to Alternatives 2 and 3 because there is no reroute at MP 7.0, the abandoned road at the reroute at MP 7.5 would be revegetated, and there are three areas of riverbank that would be replanted with native plant species.
Wildlife and Threatened and Endangered Species	Alternative 1 would have short-term, negligible adverse impacts from road maintenance on common wildlife, gray wolf, grizzly bear, Canada lynx, bald eagle, bull trout, westslope cutthroat trout, and other birds, bats, harlequin duck, and western gray squirrel, western toad, cascades frog, and Columbia spotted frog. There would be short-term moderate adverse impacts on northern spotted owls. Potential long-term adverse minor effects on all upland wildlife from loss of habitat.	Alternative 2 would have short-term, negligible adverse impacts on common wildlife, gray wolf, grizzly bear, Canada lynx, and frogs and toads from construction. There would be short-term minor adverse impacts on bald eagle, bull trout, westslope cutthroat trout, and other birds, bats, harlequin duck, and western gray squirrel. There would be long-term moderate adverse impacts on northern spotted owls. Long-term adverse minor effects on all upland wildlife from loss of 10 acres of wildlife habitat. Potential beneficial effects to frogs, toads and fish by creation of pool (backwater) habitat.	Adverse impacts from construction on wildlife including threatened and endangered species and species of concern would be similar to those of Alternative 2. Long-term adverse minor effects on all upland wildlife from loss of 9 acres of wildlife habitat. Lack of bank stabilization measures at MP 5.3 could lead to slope failure and result in sediment loading, producing a short-term adverse impact to fish and other aquatic organisms. Potential beneficial effects to frogs, toads and fish by creation of pool (backwater) habitat.	Adverse impacts from construction on wildlife including threatened and endangered species and species of concern would be similar to those of Alternative 2. Long-term adverse minor effects on all upland wildlife from loss of 8 acres of wildlife habitat.

Table 2. Summary Comparison of Impacts (continued)

Impact Topic	Alternative 1 No Action	Alternative 2 Preferred Alternative	Alternative 3 Minor Improvements	Alternative 4 No Reroute at MP 7.0
Visitor Experience	Potential impacts to visitor experience include road closures and dust generated by vehicles on gravel road. These adverse impacts would be minor and short to long-term in duration.	Short to long-term minor adverse impacts to visitor experience and to visitors in the wilderness during construction due to lack of access, dust, reduced visual quality, and noise. Long-term benefits to visitor experience from improving access and the safety and reliability of the roadway.	Short-term minor adverse impacts to visitor experience and wilderness due to construction impacts. Slightly less effect than Alternative 2 because there would be no work in the vicinity of Rainbow Loop Trail (MP 5.3).	Short-term minor adverse impacts to visitor experience and visitors to wilderness due to construction impacts such as lack of access, dust, noise, and reduced visual quality.
Park Operations	Emergency road closures due to flooding can cause short-term, moderate adverse impacts on park operations.	Short-term minor adverse impacts on park operation due to temporary delays that could occur during construction and need to monitor construction activities. Beneficial effects by improving the effectiveness and quality of the road.	Short-term minor adverse impacts on park operations similar to Alternative 2 (slightly reduced level of impact compared to Alternative 2 because of less construction). Beneficial effects similar to Alternative 2.	Similar to Alternative 2. Short-term minor adverse impacts on park operations during construction. Overall beneficial effects from improvement in the functionality of the road.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the affected environment in the vicinity of the Stehekin Valley Road and analyzes the potential effects of the alternatives on the environment. It describes the methods used to determine potential impacts, the likely project impacts, possible mitigation measures, and a determination of impairment of resources.

ASSESSMENT OF IMPACTS METHODOLOGY

The methodology that was used to determine the effects of the project on the environment is described in this section. Impacts are assessed in this document in terms of their context, duration, intensity, and type of impact. Following the analysis of impacts, there is a conclusion section that states whether or not park resources would be impaired by the project.

Context

Context is the affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as a whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic. As such, the impact analysis determines the context, not visa versa.

Duration

The duration of the impact considers whether the impact would occur in the short term or the long term. Short-term impacts are temporary or transitional-related impacts associated with project activities. Long-term impacts are typically those effects that are longer lasting or would be more permanent. However, duration is variable depending on each impact topic.

Intensity

The intensity of the impact considers whether the effect would be negligible, minor, moderate, or major. Definitions of intensity vary by impact topic and thus intensity definitions are provided separately for each impact topic. In general, the intensity thresholds have the following attributes:

- They measure intensity or “magnitude” in terms of at least two parameters (example: ability to detect, extent of disturbance, etc.).
- They form a graduated scale of intensity with fairly distinct transitional gradations between impact levels.
- They do not use duration (short term, long term) to help determine the intensity.
- They reflect the nature of effects specific to the impact.
- They allow for the quantification of both adverse and beneficial effects where possible.
- They match the impact parameters used in the analysis in the text.

Type of Impact

Impacts were evaluated in terms of whether they would be beneficial or adverse. Beneficial effects would improve resource conditions. Adverse impacts would deplete or adversely alter resources.

Impairment

Pursuant to the 1916 Organic Act, the National Park Service has a management responsibility "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." National Park Service managers must always seek ways to avoid or minimize to the greatest degree practicable adverse impacts on park resources and values. As a result, the National Park Service cannot take an action that would "impair" park resources. However, the laws do give NPS 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 NPS management discretion to allow certain impacts within parks, that discretion is limited by statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

National Park Service *Management Policies* (2001) provide guidance on addressing impairment. Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. However, an impact would more likely constitute impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's Master Plan or General Management Plan or other relevant NPS planning documents.

Impairment of park resources and values was evaluated in this EA on the basis of duration and intensity of impacts and park staff professional judgment. None of the alternatives evaluated in this EA would constitute an impairment of Park resources or values.

Cumulative Impacts Scenario

The Council on Environmental Quality (CEQ) regulations, which implements NEPA, requires 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).

The other past and ongoing or reasonably foreseeable future projects in or near the project area are described below. These include disturbance of the original 23 miles of the road, and road repair and improvement projects previously proposed and/or completed at MP 7.0, MP 8.0, McGregor Meadows, and Coon Run (see discussion below). An environmental analysis of the options for the road above High Bridge is being conducted.

A conservative estimate of the original construction of the road is that approximately 50 acres were disturbed (23 miles x 18 ft in width). This included clearing the right-of-way, cutting into slopes, placing structural fill, building the road sub-grade, and topping the sub-grade with gravel.

A project at MP 7.0 included rerouting an approximately 640-foot length of the road approximately 110 ft away from the Stehekin River. The new road was 14 ft in width with 2-foot shoulders. The abandoned roadbed was scarified and the area re-vegetated. This project was completed in 2003.

A project at MP 8.0 included construction of two rock stream barbs and bioengineering. The rock barbs were spaced approximately of 200 ft apart and protruded into the river channel approximately 10 ft. Approximately 500 yds^3 of rock were used to construct the barbs. Vegetation cuttings were added to the rock barbs to improve habitat. The road width in this area was reduced to 16 ft. In addition, the area of the road/riverbank above the 10-year flood elevation was vegetated to help minimize erosion and improve the stability of the road/riverbank. Most of this work has been completed to date.

A project at McGregor Meadows involved constructing eight to ten grade control structures in pilot channels. Each grade control structure used one to two yds^3 of large angular rock each, for a maximum total of 10 to 20 yds^3. Installation of the grade control structures required excavating a trench across the overflow channels just above the head cut (area of active erosion) and filling it with large angular rock.

The 2004 Coon Run repair project described previously (see Relationship of the Proposed Action to Other Planning Efforts) was not undertaken because of flooding and a decision by NPS staff that the road should be moved further away from the river. The revised 2005 Coon Run proposal is to reroute the Stehekin Valley Road around the Coon Run washout. This involves a 3,600-foot road reroute to the north and up onto a terrace above the river. This project would require construction of a bridge over Coon Creek, clearing (slightly over 1 acre of clearing), grading, excavation, and fill (approximately 1,000 yds^3 of fill). The impacts of rerouting the road would include clearing additional habitat, disturbing soil and vegetation, creating impervious surface, and construction-related impacts such as short-term increases in the generation of dust, exhaust emissions, and noise. This project would also rehabilitate approximately 3,800 ft of abandoned road.

The Stehekin Valley Road above High Bridge has also been damaged by recent flooding and is currently unusable (this road section runs through the Stephen T. Mather Wilderness area). The project to repair this ten-mile stretch of road is in the early planning stages and NPS is developing alternatives for evaluation. If the park is to repair and open the road above High Bridge to pre-2003 flood conditions some or all of the following actions may be required: road reroutes, raising the road grade, improving the drainage system (e.g., constructing ditches and culverts), protecting the road embankments from river erosion (e.g., placing rock barbs in the river, constructing slope stabilization measures such as crib walls or placing rock riprap, and revegetating slopes), and obliterating and revegetating abandoned road sections. Other potential alternatives include closing the road permanently or moving the wilderness boundary and shifting the road completely out of the floodplain into the area that was formerly designated wilderness (this option would require legislation).

An ongoing program in the Stehekin Valley is the forest fuel management program. The Stehekin Valley Road is the main route that would be used by visitors or residents to exit the park in the event of a wildfire. This is also the route that would be used to bring in equipment and personnel to fight wildfires in this area. Thus, protection of the road from wildfire is an important part of the strategy to protect resources and personal property in this area. As part of the fuel management program, management prescribed and controlled fires are set and thinning of the forest are methods used to reduce fuels in the valley and to maintain a healthy late successional forest.

IMPACT TOPICS

This section describes the affected environment and potential impacts of the alternatives on the following elements of the environment: soils, water quality, stream flow characteristics, wild and scenic rivers, floodplains, vegetation, wildlife, and threatened and endangered species, visitor experience, and park operations.

SOILS

The soils section describes the geology and soils in the project area and evaluates the impact of the alternatives on soils and soil forming processes.

Affected Environment

The soils of the Stehekin Valley have been influenced by a variety of geologic events, glacial activity, natural soil forming processes such as weathering of parent material, and the Stehekin River. The Stehekin Valley is located in the Chelan Mountains terrane (a terrane is an area bounded by faults that has a distinct bedrock geology and history from adjacent areas). This terrane contains rocks that originated from the ocean and volcanic activity. The oceanic rocks are highly compressed and have been recrystallized into metamorphic Skagit Gneiss. Bits of the Earth’s mantle were also incorporated into the ocean rocks and metamorphosed at some point. Similarly, volcanic rocks metamorphosed into mica schists and conglomerates. In many places these older metamorphic rocks contain younger granitic igneous material and have been thoroughly metamorphosed. These rocks are known as the Gneiss complex, which defines the Chelan Mountains Terrane.

Uplift of the North Cascade Range and repeated, intense ice ages have created the topography of the Stehekin Valley with water and gravity continuing the erosion process. The steep valley walls are covered with varying amounts of till, talus, bare rock, and colluvial soils.

The Stehekin River is largely responsible for the geology and distribution of soils types on the valley floor. The movement of the river and its tributaries erodes and deposits sediment, creating floodplains, terraces, and alluvial fans. The age, texture, and topography of these features control soil development. Soil types range from fine-grained soils such as Stapaloop to coarser-grained soils such as Goddard.

Stapaloop series soils consist of very deep, well-drained soils formed in glaciofluvial deposits or glacial till with a minor component of loess and volcanic ash in the surface. These soils are fine, sandy loams with developed horizons. They are generally located east of the Stehekin Valley Road and in McGregor Meadows.

Goddard series soils are very deep, well-drained, silt loam soils that formed in glacial outwash with a mantle of volcanic ash and in coarse-grained river deposits. These soils are located in the floodplain and low terraces along the Stehekin River. These coarse-grained soils lack cohesion and are prone to rapid rates of erosion.

Environmental Consequences

Methodology

The available information on geologic and soil resources within the project area were reviewed including literature, geologic maps, and soils surveys. An assessment was made of the soil impacts for the alternatives. Soil impacts are defined as soil compaction, erosion, and horizon disruption, which lead to a loss of soil productivity or fertility. The thresholds for the level of impact to soils are defined below.

Effect Intensity	Effect Description
Negligible	The effects to soil resources would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight and no long-term effects to soils would occur.
Minor	The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse impacts, it would be relatively simple to implement and would likely be successful.
Moderate	The effect on soils would be readily apparent, likely long-term, and result in a change to the character of the resources over a relatively wide area. Mitigation measures would probably be necessary to offset adverse impacts and would likely be successful.
Major	The effect on soils would be readily apparent, long-term, and substantially change the character of the resource in and out of the park. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.
Other Qualifiers	**Description**
Beneficial Effect	An alternative would improve the properties of the resource when compared with current conditions.
Duration of Effect	Short term – Recovers in less than 3 years; Long-term – Takes more than 3 years to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to soils be achieved in the park.

Desired Condition	Source
NPS policy is to prevent, or if that is not possible, to minimize adverse, potentially irreversible impacts on soils. This is achieved by minimizing soil excavation, erosion, and compaction during and after construction.	NPS Management Policies

Impacts of the Alternatives

Alternative 1 - No-Action

Alternative 1 would maintain current conditions and not involve major reroutes or road construction, except in the event of emergency road repairs. For example in emergency situations to keep the road open in the project area, it may be necessary to make major road repairs if riverbank erosion results in slope failures where the slope is supporting the road or where road sections are washed out due to flooding. This would require clearing additional area to move the road away from the river and disturb additional soil outside the present road prism. This would have a minor, long-term adverse impact on soils because these soils would be disturbed (i.e., the topsoil layer would be stripped reducing their productivity capability) and removed from the available supply of soil for native vegetation, but would generally be limited in the area affected. A conservative estimate of the total valley area within proximity to the 5-mile project segment is approximately 1,500 acres (i.e., the floodplain area with relatively similar soils). The potentially affected soil area from one or more road washouts is unlikely to be more than 1 percent of this total area (one percent = 15 acres).

Ongoing maintenance in the project area would also occur over time consisting of periodic replacement of gravel, particularly following flood events that result in road erosion. This additional material over time may spread out and widen the road prism and reduce the productivity in the surrounding soils. This would be a minor long-term adverse impact.

Cumulative Impacts

Several other projects have already or are likely in the future to disturb soils and reduce soil productivity. For example, projects that have affected soils include: the original 23-mile road development that impacted approximately 50 acres of soil, past road reroutes, recent emergency road improvements at MP 7.0, which disturbed approximately 0.2 acres of soil, and ongoing maintenance of the existing road (continued maintenance of the road has involved the placement of gravel which has slightly widened the road over time). The future Coon Run and Stehekin Valley Road above High Bridge projects would also disturb soils. It is unknown at this time how much soil disturbance this would actually involve for the road above High Bridge. However, it is likely that soil impacts would occur in a fairly limited area (i.e., along a narrow corridor around the existing road). For Coon Run project approximately one acre of soil would be disturbed by construction.

Past, present, and future actions would result in detectable effects that would be spread over a relatively wide area (i.e., even though the impacts are linear in nature they would have occurred over 23 miles). Thus, the combined effects of Alternative 1 and other projects would result in long term, moderate adverse impacts. However, Alternative 1 would contribute a relatively small and negligible amount of additional soil disturbance in comparison to the overall cumulative impact.

There may also be some beneficial effects from future projects that involve road reroutes and abandonment of the old road sections, because the soil in these segments could be restored with topsoil from the reroute areas and planted with native vegetation.

Conclusion

Alternative 1 would have long-term, minor adverse impacts on soils, because even though impacts would be detectable, a relatively small area would be impacted by ongoing maintenance that may include emergency road reroutes. However, the combined cumulative effects of Alternative 1 on soils would be long term, adverse, and moderate in intensity, because the soil disturbance would be spread out over a fairly wide area (i.e., along the 23 miles of roadway). Since there would be no major impact to soils, there would be no impairment of park resources or values.

Alternative 2 – Preferred Alternative

Alternative 2 would result in the clearing of approximately 10 acres of land and subsequent disturbance to these soils, which would not generally occur under the No Action Alternative except in emergency situations (as described above). However, under Alternative 2 there would be reduced need for maintenance in the form of gravel placement as compared to Alternative 1. There would also likely be less need to make emergency road repairs as compared to Alternative 1, particularly in those areas where the road would be moved farther away from the river (e.g., MP 5.3, MP 7.0, and MP 7.5) and where erosion control structures would be constructed (e.g., MP 5.3, MP 8.0).

Under Alternative 2, there would be approximately 3,300 yds^3 of cut and 11,500 yds^3 of fill (cut and fill would mainly occur in the Wilson Creek and reroute areas). Earth disturbance would reduce the productivity of soils in the disturbed areas because topsoil would be removed, structural fill material would be placed on top of the soil, and the surface would be paved.

Earth disturbance makes soil more prone to erosion from storm water runoff, particularly on slopes (although along most of the alignment where earth disturbance would be greatest, such as the road reroutes, slopes are not particularly steep). Erosion can leach out topsoil materials, particularly soils that are more susceptible to erosion such as the alluvial soils found in the project area. During excavation, soils would be mixed, moved, and replaced with fill thus causing a long-term change in the soil profiles and decreasing the productivity potential of the soil. Localized soils are also likely to be compacted by construction activities, which would temporarily decrease soil permeability, change the soil moisture

content, and lessen the water storage capacity. Paving the road with asphalt would decrease soil permeability to air and water and cause increases in localized runoff.

As part of the project, the two abandoned road sections would be obliterated and revegetated using topsoil collected from the reroute areas to the extent practicable. This would return approximately 0.8 acres to productive soil for native plants and preserve some of the existing topsoil. The soil in these areas may be temporarily impacted if these areas are used for construction staging, because construction equipment and materials would be placed on these soils resulting in compaction and/or soils disturbance outside the limits of the previous road prism. However, this would be a temporary short-term, negligible adverse impact, because the abandoned road had already disturbed the existing soils and replacement of topsoil would mitigate this effect.

Mitigation measures for adverse impacts to soils include (see Water Quality section for mitigation measures related to erosion):

- Clearly delineate clearing limits to minimize the amount of cleared area.
- Clear and grub only those areas necessary for construction.
- Reuse topsoil from the reroute areas, to the extent practicable, to obliterate and revegetate abandoned road sections.

Alternative 2 would result in long-term, minor adverse impacts on soils, because while effects would be detectable (loss of soil productivity) the area affected is relatively small in comparison to the total land area in the project vicinity (i.e., approximately 10 acres out of 1,500 acres).

Cumulative Impacts

The combined effects of other projects would be to impact soils over a fairly wide area (up to 23 miles of road corridor). Soil disturbance has occurred along most of the road and disturbance would continue for future projects under the cumulative impact scenario. For example, future projects would likely involve clearing and grading and placement of structural fill. This would remove topsoil and limit or eliminate soil productivity in those areas. Combining the area of soil disturbance (10 acres) that would occur under Alternative 2 with other projects would result in long-term, moderate adverse impacts to soil, because of the wide spread nature of the effects. Alternative 2's contribution to the cumulative total impact on soil would be small (less than 1 percent).

There would also be some long-term, beneficial effects in those areas where abandoned road sections are obliterated. In those areas the topsoil would be replaced, generally with topsoil from road reroutes, and native vegetation would be planted.

Conclusion

Alternative 2 would result in long-term, minor adverse impacts on soil productivity by: (1) The removal and loss of topsoil, (2) Temporary soil disturbance caused by construction such as compacting soils or from grading and excavation, and (3) Constructing impervious surfaces over soils effectively removing them from the supply of productive soil in the area. Soil productivity may also be reduced because soil disturbance can increase the rate of erosion, which results in the loss of topsoil. However, the effects on soil would occur over a relatively small area (less than 1 percent of the total soil productivity area). Alternative 2 would have long-term, moderate adverse cumulative effects, because combined with other actions soil has been or would be disturbed over a fairly wide area (along 23 miles of road).

There would also be some long-term, beneficial effects on soils, as soil in the abandoned road sections would be restored to support native vegetation. Since there would be no major adverse impact to soils, there would be no impairment of the park's resources or values.

Alternative 3 – Minor Improvements

Alternative 3 would result in 9 acres of soil disturbance, which would not generally occur under Alternative 1 except in an emergency situation where the road was washed out. However, there would be less potential for the road to be washed out as compared to Alternative 1. For example, at MP 7.0 and MP 7.5 the road would be rerouted and at MP 8.0 erosion control structures would be constructed. Thus, in those areas it is less likely that emergency road repairs would be required. Compared to Alternative 1, Alternative 3 would not require the continual maintenance work involving gravel placement.

Alternative 3 would have similar effects as Alternative 2 on soils, because there would be additional soil disturbance. However, the severity of the construction impacts on soils would be slightly less compared to Alternative 2, because there is slightly less clearing due to a shortened reroute at MP 7.5 and there would be no improvements at MP 5.3 or MP 6.0. Also, the cut and fill amounts (1,700 yds^3 of cut and 9,700 yds^3 of fill) would be less than what is required for Alternative 2.

Alternative 3 would have a minor adverse impact on soil, because although soil productivity would be lessened, the area of direct soil impact is small compared to the total soil productivity area within the valley (less than 1 percent). These effects would be long-term because soils will be covered with impervious surface (i.e., asphalt and gravel).

Mitigation measures for impacts to soil would be similar to Alternative 2. Under Alternative 3, the abandoned road sections would be obliterated and revegetated as described for Alternative 2.

Cumulative Impacts

The cumulative effects of other projects have resulted in soil disturbance along the 23-mile Stehekin Valley Road corridor. Soil productivity has been reduced or eliminated because of gravel placement and construction of impervious surface. Thus, the effects on soil productivity are wide spread. Future projects are likely to have long-term, minor adverse impacts similar to Alternative 3, since these would be fairly localized. However, combining Alternative 3 and other projects would result in long-term, moderate adverse impacts because the effect would be to diminish potential soil productivity over a wider area. Similar to Alternative 2, Alternative 3's contribution to the effect on soils is small as the area affected would be less than one percent of the total soil productivity area.

Conclusion

Alternative 3 would have long-term, minor adverse impacts on soils by disturbing soils and reducing soil productivity, but affect slightly less soils than Alternative 2. However, there would be cumulative long-term, moderate adverse impacts on soil, because the loss of soil productivity would be readily apparent, there would be a change in the character of the resource by removing topsoil and placing gravel over soils, and the disturbance to soils would occur over a relatively wide area. Since there would be no major adverse impact to soils, there would be no impairment of the park's resources or values.

Alternative 4 – Reroute at MP 7.5

Alternative 4 would cause 8 acres of soil disturbance and subsequent loss of soil productivity, which would not generally occur under Alternative 1. Similar to other action alternatives, the proposed road improvements would alleviate the need for continual maintenance of the roadway (i.e., by spreading gravel over the roadway and slowly increasing the size of the road prism over time) and would reduce the potential need to make emergency road repairs as compared to Alternative 1.

The impacts of this alternative on soils would be somewhat less than for Alternative 2 because there would be one less road reroute. However, impacts to soils (i.e., loss of soil productivity) would be similar to the other action alternatives and the effects to soils would be detectable. However, since they would occur over a relatively small area, the adverse impacts to soils would be long-term and minor.

The general mitigation measures for soils would be similar to Alternative 2. Under Alternative 4, the abandoned road section at MP 7.0 would be obliterated and revegetated as described for Alternative 2.

Cumulative Impacts

The cumulative effects to soils from all the projects would be long-term, adverse moderate impacts, because the effects would be readily apparent and occur over the 23-mile road corridor. Past and future projects combined with the proposed project reduce the soil productivity by causing the loss of topsoil, disturbing the productive capability of the soil by grading and/or compaction, and from placing material such as structural fill over the native soils. The incremental effect on soils from Alternative 4 is minor because the area of impact (8 acres) is small compared to the soil productivity area in the vicinity of the entire roadway.

Conclusion

Alternative 4 would have long-term adverse impacts because soils would be disturbed and covered over with asphalt paving and gravel. The impacts on soils would be minor, because Alternative 4 would affect a relatively small area of soil in comparison to the total soil productivity area. However, cumulative impacts would be long-term, moderate and adverse, because soil impacts would occur over a wide spread area. Since there would be no major adverse impact to soils, there would be no impairment of the park's resources or values.

WATER QUALITY

This section describes the characteristics of the Stehekin River, in particular its water quality. Information for the affected environment section was derived from the Lake Chelan NRA GMP/EIS and Washington State Department of Ecology (Ecology) watershed and water quality database.

Affected Environment

The water quality in the Stehekin River is generally excellent. There are relatively few potential sources of water pollution within the valley because of the limited development in the area. Some potential sources of pollution include nutrients and pathogens from septic systems, pesticides from farming or orchards (in particular DDT has been a problem in Lake Chelan, but this pesticide has not been extensively used in the Stehekin Valley), or pollutants in storm water runoff such as sediment. There may also be chemicals from various activities such as small spills of oil or fuel from vehicles, or use of other toxic materials that can be taken up in storm water runoff such as fertilizers.

Ecology's Section 303(d) list of waters describes those waters of the state that do not meet federal and state water quality standards under the Clean Water Act. Ecology's proposed 2002/2004 Section 303(d) list of threatened and impaired state waters includes the Stehekin River, but lists the river as: Category 1. A Category 1 waterway meets the tested standards for clean water. Although the Stehekin River is listed as Category 1, it does have higher levels of arsenic than the listed standard.

An analysis of water quality in the Stehekin River (Johnson, et al. 1997 and Patmont et al. 1989) showed that there were natural background concentrations of arsenic that exceeded the arsenic standard, but since these were natural conditions it was not a violation of the water quality standards. Thus, the river is not being proposed for listing as threatened or impaired in the 2002/2004 Section 303(d) listing.

Perhaps the most persistent water quality problem in the Stehekin River is sediment loading, particularly from bank erosion during flood events. Erosion and the resulting sediment cause increased turbidity in the water, which can adversely affect fish and other aquatic organisms in several ways. First, sediment can fill in the spaces within spawning gravels, which adversely affects spawning success. Second, sediment can clog the gills of fish, impairing respiration or causing mortality. Finally, erosion can destroy other fish habitat areas such as pools used by fry and juveniles. Another water quality problem resulting from sediment is that it can change the chemical components of water quality such as dissolved oxygen, pH levels, or biological oxygen demand. This in turn may adversely affect aquatic species. According to the GMP/EIS (1995), the Stehekin River contributes approximately 4,120 metric tons of suspended sediment to Lake Chelan each year. This is clearly evident by the large sediment flat located at the mouth of the river at the north end of Lake Chelan, which can be seen during periods when the lake level is lowered (during the winter). Erosion of riverbanks is a natural process, and the introduction of sediment and large woody debris is an important element in the creation of aquatic habitat, including gravel bars and log jams.

Environmental Consequences

Methodology

The assessment of impacts to water quality are based on professional expertise and discussions with NPS staff.

Effect Intensity	Effect Description
Negligible	Chemical, physical, or biological effects would not be detectable, would be well below water quality standards or criteria, and would be within historic or desired water quality conditions.
Minor	Chemical, physical, or biological effects would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.
Moderate	Chemical, physical, or biological effects would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be temporarily altered.
Major	Chemical, physical, or biological effects would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would temporarily be slightly and singularly exceeded.
Other Qualifiers	**Description**
Beneficial Effect	Chemical, physical, or biological properties of water quality would be improved compared with existing conditions.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to water quality be achieved in the park.

Desired Condition	Source
Take all necessary action to maintain or restore the quality of surface or ground waters within the park consistent with the Clean Water Act and other applicable federal, state, and local laws and regulations.	NPS Management Policies; Clean Water Act; Washington Hydraulic Code

Impacts of the Alternatives

Alternative 1 - No-Action

Under Alternative 1, water quality could be slightly impacted by maintenance of the road section between MP 4.0 and MP 9.15. There would be ongoing maintenance in the form of gravel placement, because portions of the road are scoured frequently by floodwater. This results in erosion, which releases sediment into the river from the road surface and/or road base. Storm water runoff can also cause erosion from the road surface and result in sediment being carried into the river, particularly where the road is located in close proximity to the river. However, the road itself is not generally a large source of river sediment. Natural runoff, erosion, and the natural process of the river meandering throughout its floodplain within the approximately 205,440-acre watershed cause most of the sediment load. The road in the project area covers approximately 7.5 acres (the total 23 miles of road affects approximately 50 acres). The river valley (floodplain) in the same area as the road project is made up of approximately 1,500 acres. Thus, the 7.5 acres of road area within the 1,500-acre project area constitutes less than one percent of the floodplain in the project area.

The sediment contribution from the project segment of the road to the river would be very small in comparison to the volume of sediment carried by the river, particularly during the rainy season or flood events. However, in the event of a washout, sediment originating from the road may be detectable in a localized area (the area immediate to the washout). Any sediment from the road would be quickly dissipated because of the relatively high stream flow in the river, particularly during a flood event. Thus, Alternative 1 could potentially have short-term effects to water quality, and if there were adverse impacts they would be localized and minor.

Road operations may also result in water quality impacts. Vehicles spill minor amounts of oil, fuel, and other contaminants (such as material from brake linings), which can be suspended by storm water and carried into the Stehekin River or its tributaries (this is less likely with the existing gravel road as compared to a paved surface because there is more ability for the road to soak up the spilled material [Note: Gravel roads are generally considered to be impervious surfaces for storm water runoff design and water quality treatment purposes]). Contaminants in storm water can affect several water quality parameters such as the amount of dissolved oxygen in the water, turbidity, and pH. Large-scale changes in these parameters can adversely affect biological resources such as fish. However, since the level of traffic on the Stehekin Valley Road is relatively low, the road is well separated from the river in most places, and there is a relatively high volume of water in the river, contaminants from vehicles would result in long-term, negligible adverse impacts.

Cumulative Impacts

Past actions may have had some effect on water quality. For example, construction of the original road and subsequent maintenance has provided a source of erodable material that has frequently been affected by floodwaters. Flooding has washed away segments of the road and resulted in short term increases in turbidity. However, this adverse water quality impact is temporary in nature and the river already carries a high volume of sediment during flood events, thus the incremental increase is small.

Other present and future actions may result in both adverse and beneficial effects. For example, long-term, minor adverse impacts would be caused by implementing the No Action Alternative and continuing to lay gravel over the roadway to maintain the road. This activity provides a source of erodable material that has the potential to result in sediment that makes it way into the Stehekin River from stormwater runoff or flooding. In addition, there are road sections located close to the river that are experiencing increased erosion and unless the road is moved or the bank is stabilized, the result may be slope failure and sediment impacts.

Other actions such as the Coon Run project would remove vegetation and disturb soils and there also may be some in-water work or riverbank stabilization, which can result in temporary or more frequent increases in turbidity in the river. However, paving the Stehekin Valley Road from the Stehekin Landing to MP 4.0 has provided a benefit because the road in this area is fairly stable and not as prone to erosion as other gravel portions. Also, future projects include alternatives for moving the road away from the river thus reducing the potential for erosion of the road and resulting water quality impacts such as turbidity (from erosion).

Generally, the volume of sediment contributed by past, present or future actions combined with the No Action Alternative would be minor in relation to the total volume carried by the river (turbidity may be detectable, but would be well below water quality standards). Also, the relatively high volumes of water in the river quickly negate any temporary increase in turbidity. Thus, cumulative adverse impacts to water quality would be minor and short-term.

Conclusion

Alternative 1 would have minor, short-term adverse impacts on water quality, because while the potential contribution of sediment to the river would be detectable under some circumstances such as severe flooding and washouts of the road it would be a localized and temporary effect. Similarly, cumulative adverse impacts on water quality would also be minor and short term, because of the large volume of stream flow and sediment in the river as described above. Since there would be no major adverse impacts to water quality, there would be no impairment of the park’s resources or values.

Alternative 2 – Preferred Alternative

Water quality could potentially be impacted during construction by the following activities: (1) In-water work to install stream barbs (once constructed these may also produce downstream effects such as erosion – see Stream Flow Characteristics section), (2) Earth disturbance during clearing and grading, (3) Stockpiling of earth materials, and (4) Potential spills of fuel or oil during construction activities such as refueling equipment.

The in-stream work would involve placing large rocks in the river and at its edge, which would disturb the streambed and dislodge sediment into the water column. This would be a short-term adverse impact and be minor in effect, because even though there may be measurable changes in turbidity, stream flow would rapidly dissipate any disturbed sediment because of the high stream flow, and the in-stream work would be completed relatively quickly (i.e., in several weeks). In addition, the river bottom substrate is

fairly coarse and made up of gravel, cobbles, and small boulders, thus there are few silt or clay sized materials available to be taken up in the water column to cause turbidity.

In stream work is not likely to occur under Alternative 1, thus Alternative 2 would potentially result in greater short-term, minor adverse impacts to water quality when compared to Alternative 1. However, Alternative 1 would result in long-term adverse impacts due to the ongoing placement of gravel on the road, which would not occur under Alternative 2 because the road would be paved.

Clearing and grading would occur all along the alignment, but would be particularly intensive in the reroute areas (MP 7.0 and MP 7.5), where new road grades would be established and at Wilson Creek (MP 5.3) where the road would be cut into the slope. Approximately 10 acres of land would be disturbed during construction. Disturbance of earth materials can result in erosion caused by rain and storm water runoff. Runoff can pick up sediment and transport it into water bodies such as the Stehekin River. Similarly, stockpiled earth materials are also susceptible to erosion from storm water. Storm water could potentially carry sediment into the Stehekin River, particularly in those locations where the road closely parallels the river (e.g., between MP 7.5 and MP 8.0) or is located close to tributary streams. Erosion and sediment impacts could occur periodically whenever there is a rainfall event during construction. Potential erosion-generated sediment associated with construction is likely to be undetectable, because most of the work does not occur close to the river and mitigation measures can largely control erosion and sedimentation. Thus, any adverse sedimentation impact on water quality would be localized, negligible in effect, and of short duration (lasting during the construction period).

The clearing and grading work would generally not occur under Alternative 1, except under emergency conditions to keep the road open following flooding. Thus there is a greater potential for adverse impacts to water quality under Alternative 2 than Alternative 1 from this work.

The following conservation (mitigation) measures were taken from the Biological Opinion produced by the U.S. Fish and Wildlife Service for the project. Best Management Practices to control erosion and sedimentation shall be implemented, including the following:

- The area to be cleared will be clearly marked on the ground to minimize the amount of cleared area.
- Only those areas necessary for construction will be cleared.
- Topsoil duff from the reroute areas will be used to rehabilitate (re-create habitat) the obliterated road segments.
- The amount of disturbed earth area and the duration of soil exposure to rainfall will be minimized.
- Erosion-containment controls such as silt fencing and sediment traps (e.g., check dams and hay bales) will be used to contain sediment on site.
- Temporary diversion devices such as culverts, and trenches, or French drains will be used to direct surface away from exposed slopes.
- Slopes will be scarified, if necessary, to slow erosion.
- Storm water will be directed away from disturbed areas into temporary settling basins.
- Disturbed soil will be covered with plastic sheeting, jute matting, erosion netting, straw, or other suitable cover material.
- Disturbed earth will be revegetated with non-exotic plants as soon as practical.

- Staging and stockpiling areas will be located away from the Stehekin River and these areas will be delineated with temporary fencing or tape to prevent incremental expansion of the staging area.

Construction activities such as refueling and use of heavy equipment may result in spills of oil or fuel that could enter the river during storm water runoff or directly enter the river depending on the proximity of activities such as refueling. Contaminants such as oil in storm water runoff could cause short-term adverse negligible to minor effects (this would be dependent on the size of the spill) to water quality by affecting the chemical properties of the water. Best Management Practices to control adverse impacts of fuel spills shall be implemented, including the following:

- Refueling activities will be done at least 100 feet from the river and its tributaries.
- Areas where refueling or maintenance of equipment will be done will be identified and will have containment devices such as temporary earth berms surrounding these areas.
- Absorbent pads will be available to clean up spills.
- Contract specifications will include restrictions on the location of fueling sites, requirements for spill containment, and other measures to safeguard aquatic and terrestrial habitat from construction-related contaminants.

Under Alternative 2, construction impacts to water quality would be short-term, minor, and adverse in effect with mitigation.

As described under Alternative 1, road operations under Alternative 2 can cause water quality impacts. Vehicles can spill minor amounts of oil, fuel, and other contaminants such as material from brake linings onto the road surface. These pollutants can be suspended by storm water and carried into water bodies (particularly if the road surface is paved). Contaminants in storm water can affect several water quality parameters such as the amount of dissolved oxygen in the water, turbidity, and pH, which can adversely affect biological resources. However, traffic on the Stehekin Valley Road is relatively low, the road is well separated from the river in most places, and there is a relatively high volume of water in the river, therefore, contaminants from vehicles would result in long-term, but negligible adverse impacts.

Paving the Stehekin Valley Road would also have a beneficial effect on water quality. Paving the road would reduce the need to place gravel on the road and minimize a source of erodable material during floods. This would reduce the occurrence and severity of sediment loading and turbidity in the river. Thus, Alternative 2 would provide more benefits to water quality when compared with the No Action Alternative, which would continue to maintain the gravel road in its present state.

Cumulative Impacts

Alternative 2 would have short-term, minor adverse impacts. Other projects have in the past and could in the future result in some temporary effects on the water quality in streams that cross the Stehekin Valley Road or in the Stehekin River. The potential effect on water quality includes increases in turbidity and changes to the chemical properties of water, which would be caused by: erosion and siltation resulting from vegetation removal and soils disturbance during construction, any in-water or riverbank work, spills of fuel or oil during construction, maintenance activities associated with placing gravel on the roadway (this may occur in the areas upstream above MP 9.15). However, these adverse impacts are short-term (lasting only the duration of the construction period) and do not produce lasting adverse impacts or generally any cumulative effects, because high stream flows rapidly dilute any chemical changes and dissipate any turbidity. Combining the effects of other projects with Alternative 2 would result in short-term minor adverse cumulative impacts on water quality.

Conclusion

Alternative 2 would have short-term, minor adverse impacts on water quality. Even though there could be some measurable changes in water quality (i.e., increased turbidity levels), these levels would be well below water quality standards. This alternative also benefits water quality by paving the road and removing a source of erodable material that could result in sediment impacts during floods. Cumulatively, there would be short-term, minor adverse impacts on water quality. Since there would be no major adverse impact to water quality, there would be no impairment of the park's resources or values.

Alternative 3 – Minor Improvements

Alternative 3 would disturb 9 acres of soil from the clearing and grading activities associated with construction. Disturbed soils increase the potential for erosion to occur and for sediment to be carried into receiving waters during storm water runoff. Sedimentation impacts include increased turbidity. This would be a short-term minor adverse impact on water quality. This alternative also involves in-water work, which would result in temporary increases in turbidity. These adverse impacts would be short-term and minor in effect. Also, potential spills of fuel or oil during construction would likely have negligible adverse and short-term effects as long as mitigation similar to that described for Alternative 2 is implemented.

The clearing and grading of 9 acres would not occur under Alternative 1, except for conditions requiring emergency road repairs following floods. Thus, there is generally a greater potential for short-term adverse impacts on water quality under this alternative than for Alternative 1. However, road maintenance work involving gravel placement would continue to occur under Alternative 1 (not under Alternative 3). Thus Alternative 1 it is more likely to produce long-term adverse impacts to water quality (i.e., increased turbidity) as compared to Alternative 3.

One of the main differences between Alternatives 2 and 3 is that there would be no road improvements at Wilson Creek or MP 6.0, and the reroute at MP 7.5 would be shorter. Since there is less overall disturbance to soils and there would be no work involving laying back the slope of the riverbank at MP 5.3, there is a slightly reduced potential for sediment impacts from construction under this alternative as compared to Alternative 2. However, there would remain the problem of Wilson Creek jumping its banks during high flows, which results in the creek spreading out across the slope and overrunning the road causing erosion of the road surface and sediment to be carried into the Stehekin River.

Alternative 3 would have a beneficial effect on water quality by paving the Stehekin Valley Road. Paving the road would reduce the need to place gravel on the road and minimize a source of erodable material during floods, which would reduce the occurrence and severity of sediment loading and turbidity in the river. Thus, Alternative 3 would provide more benefits to water quality when compared with the No Action Alternative, which would continue to maintain the gravel road in its present state.

Potential mitigation measures would be identical to Alternative 2.

Cumulative Effects

Alternative 3 would result in adverse short-term minor impacts on water quality. Other projects could also produce short-term minor adverse impacts on water quality by increasing the potential for erosion to occur (from clearing and grading), from disturbing bottom sediments during in-water work, or from continuing to place gravel on the roadway. However, when Alternative 3 is combined with other projects the potential cumulative water quality impacts (such as increased turbidity) would still be short-term and minor, because while increases in turbidity may be detectable, turbidity would be quickly dissipated by stream or river flow. Therefore, there would be short-term, minor adverse cumulative impacts on water quality.

Conclusion

While Alternative 3 would have a slightly reduced level of effect on water quality as compared to Alternative 2, changes in water quality caused by erosion and sediment (increased turbidity) particularly during construction would result in detectable changes to water quality. These adverse impacts would be short-term and minor because the effects are localized and turbidity would quickly dissipate. There would also be some beneficial effects on water quality resulting from paving the road similar to what was described under Alternative 2. The cumulative adverse impacts to water quality would be short-term and minor in intensity. Since there would be no major adverse impact to water quality, there would be no impairment of the park's resources or values.

Alternative 4 – Reroute at MP 7.5

Similar to Alternatives 2 and 3, this alternative would result in soil disturbance from clearing and grading and in-water work that is likely to have a potential adverse impact on water quality. Approximately 8 acres would be cleared, which would disturb soils and increase the potential for erosion and sedimentation to occur. Similarly, in-water work would also increase the amount of sediment and turbidity in the river. While turbidity would be detectable, the increased turbidity levels would not exceed the desired water quality conditions, nor would the increased turbidity levels be a long-term event. This is due to the fact that the river bottom substrate is fairly coarse and made up of gravel, cobbles, and small boulders, thus there are few silt or clay sized materials available to be taken up in the water column to cause turbidity. Also, the high stream flow ensures that turbidity increases are localized. Since, there already is a relatively large sediment load in the river increased turbidity from the proposed work would be a minor increment. In addition, the riverbank would be stabilized under this alternative, which would protect the riverbank from future stream erosion and help to minimize sediment and turbidity from this location (Note: There could be some downstream impacts such as erosion from constructing the rock stream barbs – see Stream flow Characteristics section). Therefore, Alternative 4 would have minor, short-term adverse impacts on water quality.

The proposed in-water and roadwork under Alternative 4 would not occur under Alternative 1. Comparing Alternative 4 to Alternative 1, there would be more short-term adverse impacts under Alternative 4, but there would be ongoing long-term impacts on water quality from Alternative 1. Alternative 1 would continue the placement of erodable material over the road and would not gain the benefits derived from Alternative 4 related to paving the road and reducing the potential for road erosion to occur.

Cumulative Effects

The potential adverse water quality impacts from Alternative 4 would be short-term and minor in effect. Other past, present, and future projects would also result in short-term adverse impacts similar to what was described for Alternative 4 above. Combining the effects of other projects with Alternative 4 would result in temporary impacts on water quality such as increases in turbidity from in-water work or soil erosion during construction of road improvements. However, any increases in turbidity would have a minor effect on water quality because there is already a high sediment load in the river and the added turbidity from the combination of projects would be a minor component of the total sediment load. Thus, cumulative adverse impacts to water quality would short-term and minor in intensity.

Conclusion

Alternative 4 would have short-term minor adverse impacts on water quality due to the clearing and grading and in-water construction work, which would result in detectable levels of turbidity. However, the turbidity would rapidly dissipate from high stream flows and the amount of increase in turbidity compared to the sediment load in the river would be small. This alternative would also provide some beneficial effects on water quality by reducing the potential for riverbank erosion and resulting turbidity by using bioengineering and rock stream barbs and by removing a source of erodable material by paving the road. Cumulative adverse impacts on water quality would be short-term and minor. Since there would be no major adverse impact to water quality, there would be no impairment of the park's resources or values.

STREAM FLOW CHARACTERISTICS

This section describes the stream flow characteristics of the Stehekin River. Information for this section was derived from U.S. Geological Survey (USGS) stream flow data, and the Lake Chelan NRA GMP/EIS. In addition, a stream reach and habitat analysis was prepared by NPS staff to assess the effects of bank hardening options. The reach analysis relied heavily on the 1981 FEMA floodplain study, a USGS study of the McGregor Meadows area (Nelson, 1986), a Stehekin Floodplain Study published in 1993 (Riedel 1993), and Chelan Public Utility District funded studies on sedimentation and flood backwater effects (Chelan PUD 2001). Analysis of river channel stability by reach was made possible largely by a series of aerial photographs and a set of seven digitized river channel locations from 1953, 1962, 1978, 1988, 1992, 1998, and 2004. Two-dimensional hydraulic models developed by the NPS for the Company Creek Road Environmental Assessment were also used.

Affected Environment

General Stream Flow Conditions

The Stehekin River has a drainage area of about 321 square miles. The drainage is almost entirely undeveloped, with most of the watershed congressionally designated Wilderness. The USGS maintains a gauging station (USGS 12451000) on the Stehekin River 1.3 miles upstream of Lake Chelan. Stream flow data for this gauge is available for a period of record from 1911 through 2002, with the exception of the period from 1916 through 1926. For this period of record, mean monthly low flows (i.e. baseflow) range from approximately 400 to 600 cubic ft per second (cfs) (Figure 9). With increasing spring snowmelt, flows steadily increase and typically peak in May or June. The mean monthly peak flow for the entire period of record is 4,167 cfs occurring in June. After the spring peak, flows steadily decline to near baseflow levels (by September or October), and generally remain at this level until fall flood events.

Annual peak flows during the same period have ranged from 3,530 cfs in 1915 to an estimated 26,000 cfs in October of 2003 (Figure 10). The Stehekin River is prone to frequent flooding because of its geographic position and flat valley floor hemmed in by steep, rocky slopes. The headwaters of the Stehekin River are located near Cascade Pass on the crest of the Cascade Range in an area of higher precipitation than is typical of other east-side streams. Subsequently, there have been six large floods in the Stehekin River over the past 15 years. For example, the November 1995 flood was estimated to be a 100-year flood event, and the flood event in October 2003 had an estimated recurrence interval of 500 years. In addition to these exceptionally large floods, 10-25 year recurrence interval floods occurred in 1989, 1990, 1997, and 1999.

Figure 9. Mean Monthly Stream flow from 1911 through 2002 (not including years 1916 through 1926) at USGS Gauge Station 12451000 on the Stehekin River at Stehekin, WA.

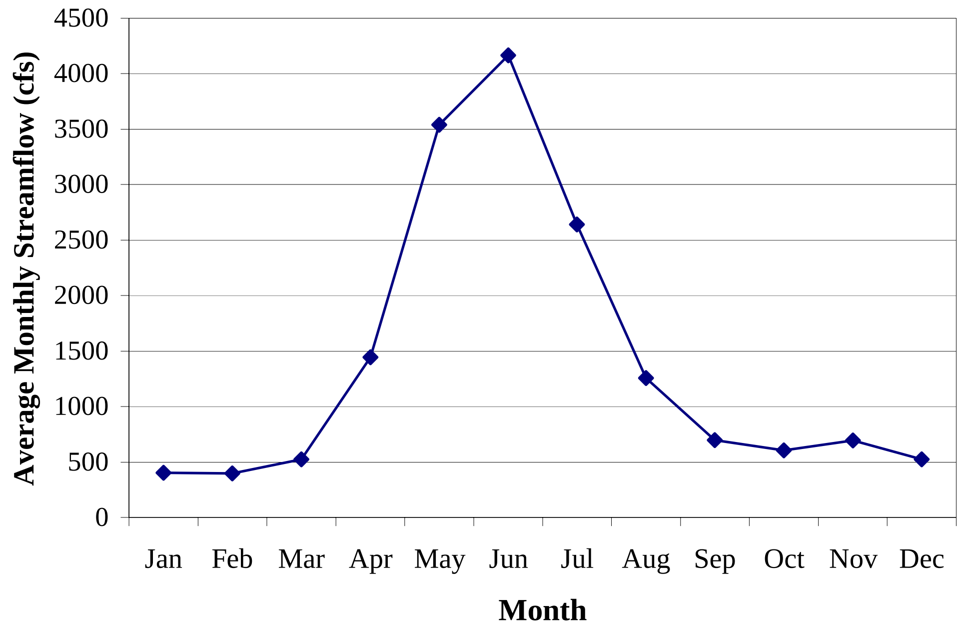
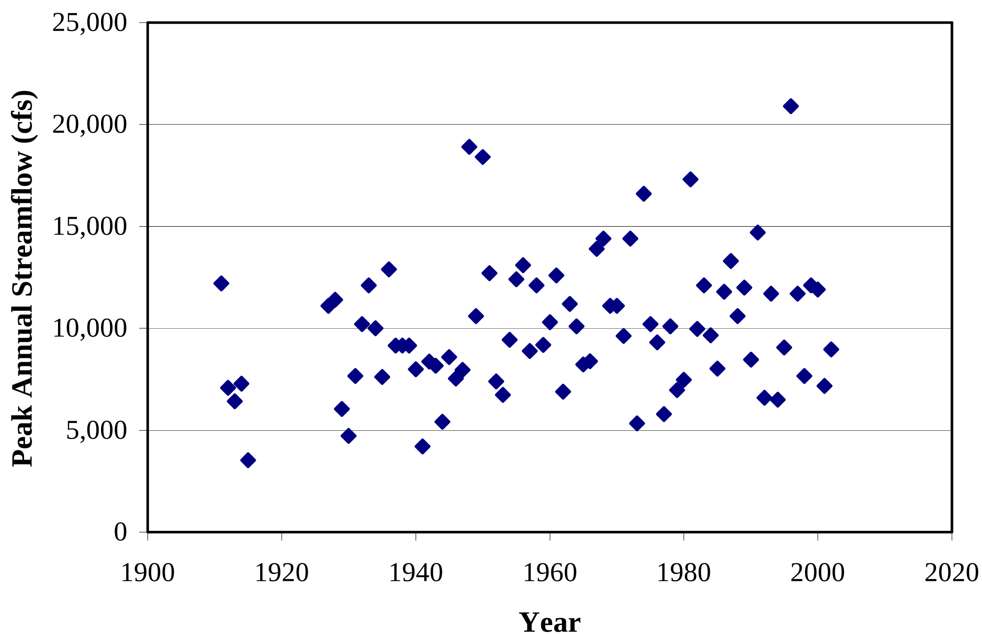


Figure 10. Peak Annual Stream Flow from 1911 through 2002 (not including years 1916 through 1926) at USGS Stream Gauge 12451000 on the Stehekin River at Stehekin, WA.



Larger than average spring floods occur when the snow pack persists into late May and June when warm late spring rains cause rapid rates of snowmelt. Five of the eight largest floods on record were spring events, which can last for several days to a week or more. Though the mean monthly flow indicates that high flows typically occur in the spring, flooding can also occur in the fall when early winter rain-on-snow floods occur after some snow has accumulated in the mountains. The result is rapidly melting snow that contributes flow to the already rain-filled channels. Fall floods typically have a higher peak discharge, but are of shorter duration than spring floods.

Flooding has caused large changes in the Stehekin River, and associated damage to the Stehekin Valley Road. For example, floods have initiated a major realignment of the Stehekin River at McGregor Meadows and the recurrence interval of flooding at that site has also changed, with flooding occurring more frequently and at lower flows as a result of the floodplain and channel-forming processes. The estimated discharge and flood frequency intervals of the Stehekin River are presented in Table 3. As a result of past flooding and erosion, river processes within the project area are now strongly influenced by erosion control structures such as bank armoring and rock barbs that serve to deflect flow away from riverbanks.

Table 3. Estimated Discharge and Frequency of Large Magnitude Floods on the Stehekin River at USGS Stream Gauge 12451000

Discharge (cfs)	Recurrence Interval
14,570	10 years
18,400	50 years
19,920	100 years
23,270	500 years

- Table and calculations provided by the NPS.

Selected Stream Reach Conditions in the Project Area

This section describes the characteristics of 3 stream reaches on the Stehekin River within the project area. Descriptions of each reach include average depths and widths, flood prone areas, channel gradient, sinuosity, large wood accumulation, and stream habitat such as riffle, pool, and side channel types.

The lower Stehekin River flows through a deep glacially carved valley into Lake Chelan. Glacial deposits are important in defining the river channel pattern in the lower Stehekin. A large glacial moraine runs along the northeast side of the valley (Figure 11). This moraine has generally defined the limit of channel migration on the left bank. Steep valley walls contribute large amounts of sediment – particularly at the outlets of canyons on first and second order streams. Valley walls and debris cones from tributary streams also control the limits of channel migration in the three study reaches (Figure 11). No bedrock control was observed at any of the three reaches. Within the 3 miles containing the analyzed reaches the longitudinal profile of the Stehekin River undergoes several significant changes. These changes define the riffle-pool sequence along the river, and determine relative channel stability, large wood accumulation and stability, and other habitat factors.

For the purposes of the study, three reaches were defined on the Stehekin River in the project area (Figure 11), and their physical characteristics are listed in Table 4. The Stehekin River through all three reaches is classified as high gradient, with Reaches 1 and 2 at 0.008 percent and Reach 3 slightly higher at .011 percent.

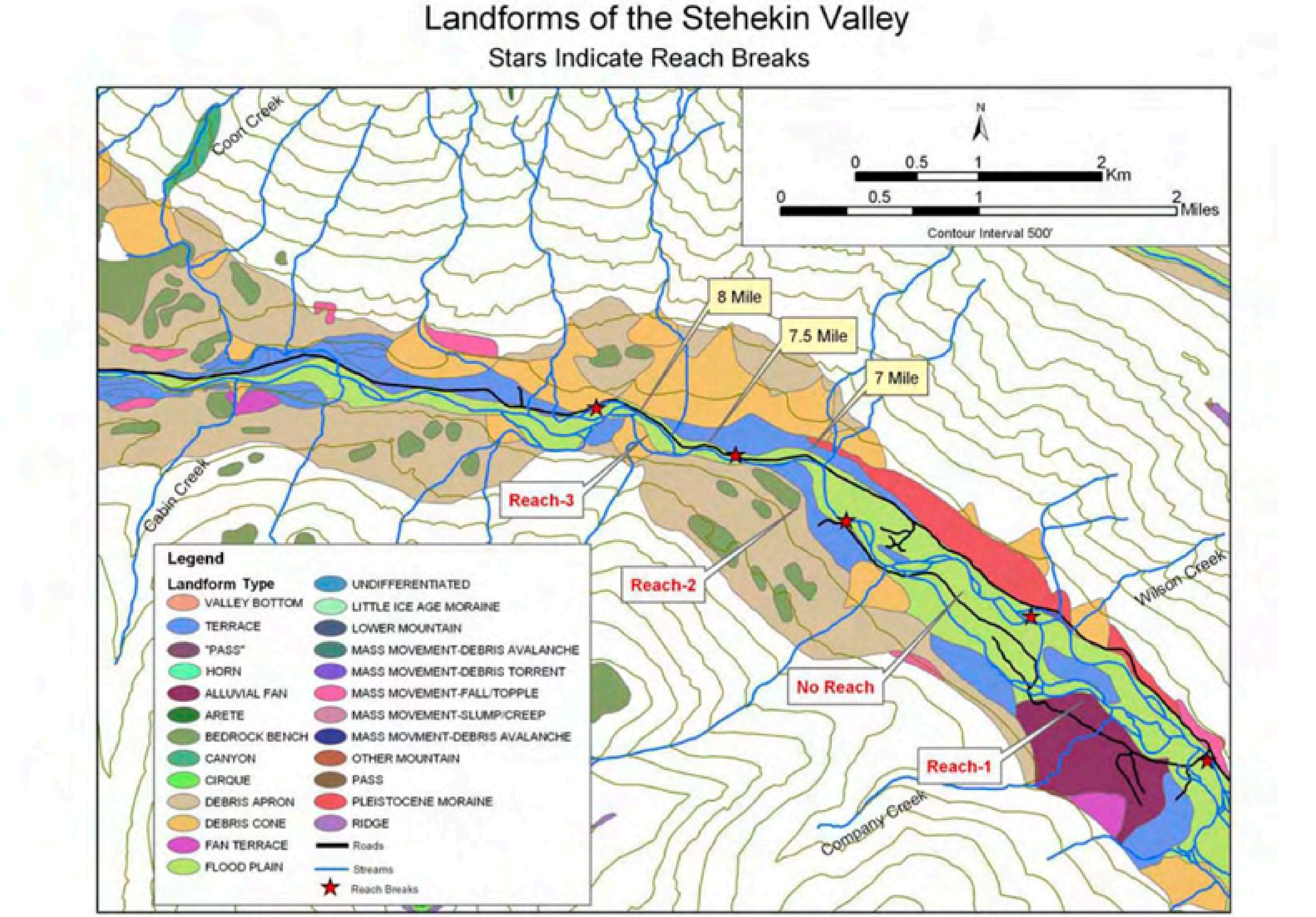


Figure 11
Stehekin Valley Geomorphology - Stream Reaches

Table 4. Stream Reach Physical Characteristics

Reach	Length (ft)	Bankfull Width (ft)	Width/Depth Ratio	Max. Bankfull Depth (ft)	Flood Prone Area Width (ft)	Channel Gradient	Sinuosity
1	6,000	300	55.5:1	5.4	803	0.008	1.19
2	5,000	250	31.6:1	7.9	853	0.008	1.27
3	3,000	150	12.8:1	11.7	353	0.011	1.15

Reach 1

In Reach 1 the Stehekin River has migrated over time between a large glacial lateral moraine on its left bank and the extensive alluvial fan of Company Creek on its right bank (Figure 11). The main channel of the river is paralleled by an abandoned channel on the floodplain of the right bank, which appears to have been the active channel in the early 1900s. Avulsion of this abandoned channel and occupation of the present alignment occurred sometime before 1953 (Figure 12).

Stream gradient in Reach 1 varies significantly. In the upper part of the reach the gradient is 0.0089 percent, while in the lower part of the reach the gradient drops to 0.0039 percent. The substrate in this reach ranges from cobble and boulder to gravel. Main channel flood velocities in this reach are on the order of 5 cfs. The typical bankfull width is approximately 300 ft, while the maximum bankfull depth averages 5.4 ft. The width to depth ratio is 55.5:1. All of these values reflect the broad, alluvial nature of this reach.

Sinuosity is relatively low at 1.19, although Figure 12 clearly shows that sinuosity has increased steadily in the upper parts of this reach. Associated with increased sinuosity is growth of gravel bars and bank erosion. To protect riverbanks there are currently 18 erosion control structures within this reach, affecting approximately 3,980 ft of riverbank. Structures include rock barbs and cabled logs on the right bank and log cribbing on the left bank.

Reach 1 represents a significant storage zone for large woody debris, and 17 individual logjams have been identified and mapped. In a 2000 survey approximately 246,586 ft^3 of large wood was inventoried in this reach, representing an approximately 400 percent increase from a 1984 large wood survey.

Habitat in Reach 1 is characterized by riffle pool sequences. Seven long riffles dominate the reach, accounting for 87 percent of all main channel stream habitats (approximately 262,611 ft^2). Side channels are also a significant habitat feature in this reach (544,816 ft^2), and have half as much habitat as the main channel. The system of abandoned channels on the right bank of the river's floodplain accounts for most of the side channel habitat. Pool habitat is limited in Reach 1 to two pool features covering approximately 28,908 ft^2 of habitat.

Reach 2

The Stehekin River channel in Reach 2 migrates across a broad alluvial floodplain between river terraces on both banks (Figure 13). The most significant change in valley geomorphology within the lower Stehekin River above the head of Lake Chelan occurs at Reach 2, where valley width increases from a width of 500 ft to a half-mile. Flood prone area and bankfull width also increase significantly in this reach (Table 4). This change coincides with a drop in stream gradient from 0.015 percent to 0.008 percent. Flood velocity in the main channel is estimated at 9 cfs.

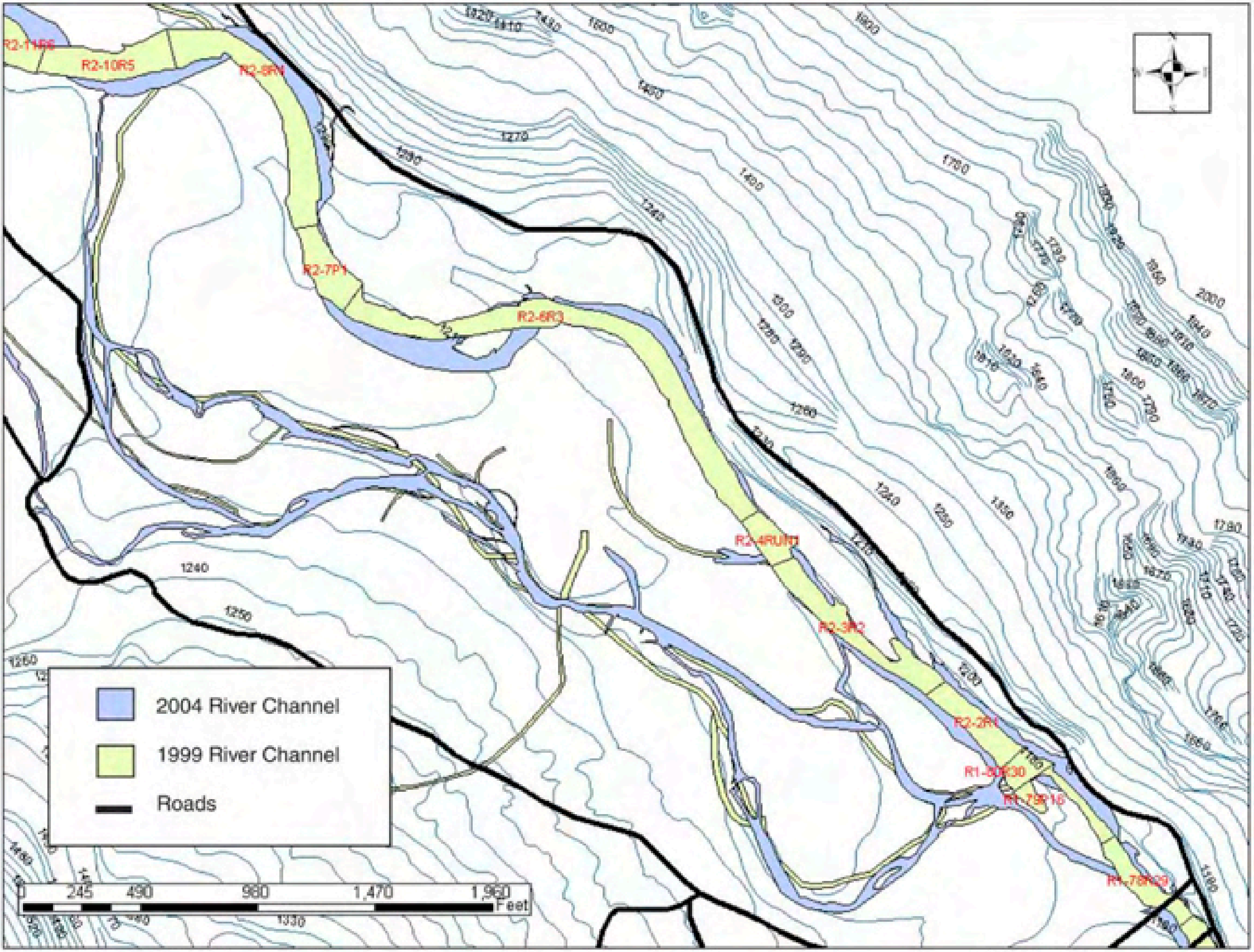


Figure 12
Stehekin River Channels
1999 and 2004, Reach 1

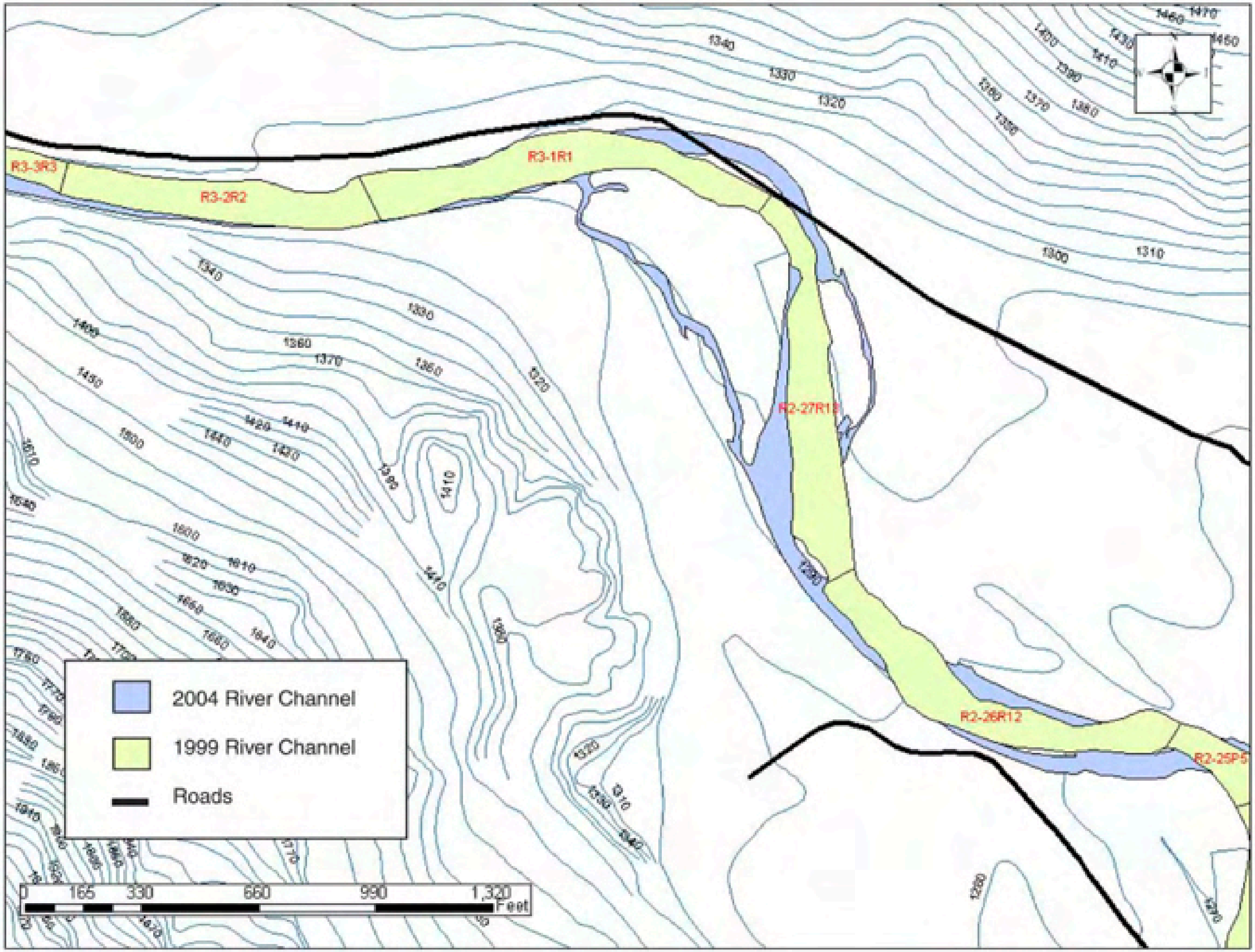


Figure 13
Stehekin River Channels
1999 and 2004, Reach 2

Due to these physical changes in valley width and stream gradient, Reach 2 is located in an area where the Stehekin River channel is very unstable. Illustrating this is the fact that a major stream avulsion is underway just downstream of Reach 2 that will reroute the main channel through McGregor Meadows down Noname Creek (Figure 13). Sinuosity in Reach 2 is 1.27, which is higher than the other two reaches (Table 4), and has been increasing steadily since the 1950s. The increase in sinuosity is associated with rapid point bar growth and bank erosion. In the October 2003 flood, bank erosion of more than 50 ft was recorded on the right bank at the lower end of Reach 2. In response to bank erosion issues, the NPS and private landowners have installed seven erosion control structures in this reach covering a liner distance of 1,565 ft at three locations.

Bankfull width in Reach 2 is 250 ft, while maximum bankfull depth is 7.9 ft. (Table 4). Repeat surveys of the river channel in this reach indicate that bankfull width is increasing, while bankfull depth has decreased. These changes are associated with the ongoing channel avulsion described above, and are directly related to deposition of sediment as main channel conveyance is decreased.

Reach 2 is located in an area that changes from a net large wood transport zone upstream to a storage zone downstream. Reach 2 contains seven large logjams (526,811 ft^3). Large wood has accumulated rapidly in this area between surveys in 1984 and 2000, with an approximately 1,890 percent increase in large wood volume. Large woody debris accumulations have played a major role in channel stability and pattern in Reach 2. For many years a rapidly growing logjam prevented some flow from following Noname Creek. However, the record October 2003 flood punched a hole in the logjam, thereby rapidly increasing conveyance down the avulsion route and decreasing flow down the main channel.

Stream habitat in this reach is confined primarily to the main channel, with a noticeable absence of pool and side-channel habitat. Within Reach 2 all habitat was classified as riffle, covering an area of approximately 148,028 ft^2.

Reach 3

The Stehekin River channel in Reach 3 flows between a glacial moraine and river terraces on its left bank, and tributary debris cones and the valley wall on the right bank (Figure 11). Due to its confined nature in this reach, channel geometry is much different than in Reaches 1 and 2, with significant reductions in bankfull width (150 ft) and flood prone area width (353 ft) (Table 4). Maximum bankfull depth (11.7) in Reach 3 is significantly higher than the other reaches (Table 4).

The sinuosity (1.15) in Reach 3 is also relatively low when compared to Reaches 1 and 2. Examination of the channel changes map reveals that the river channel position is fairly stable through Reach 3, in contrast to very unstable reaches both upstream and downstream. One exception to this pattern is that during the October 2003 flood the river switched to flow on the southwest (right bank) side of a small mid-channel island (Figure 14).

Stream gradient in this reach is high at 0.011 percent, and the substrate is composed of boulders and cobbles. Flood flow velocities are in the range of 10-11 cfs. High stream velocity and deep flood flows have resulted in significant bank erosion problems in this reach where the Stehekin River flows directly against the toe of the glacial moraine and along the river terrace on its left bank (Figure 14). As a result, the NPS has installed two rock barbs and bioengineering to protect approximately 200 lineal ft of the bank at MP 8.0, and three other structures are also located in this reach that impact another 150 ft of riverbank.

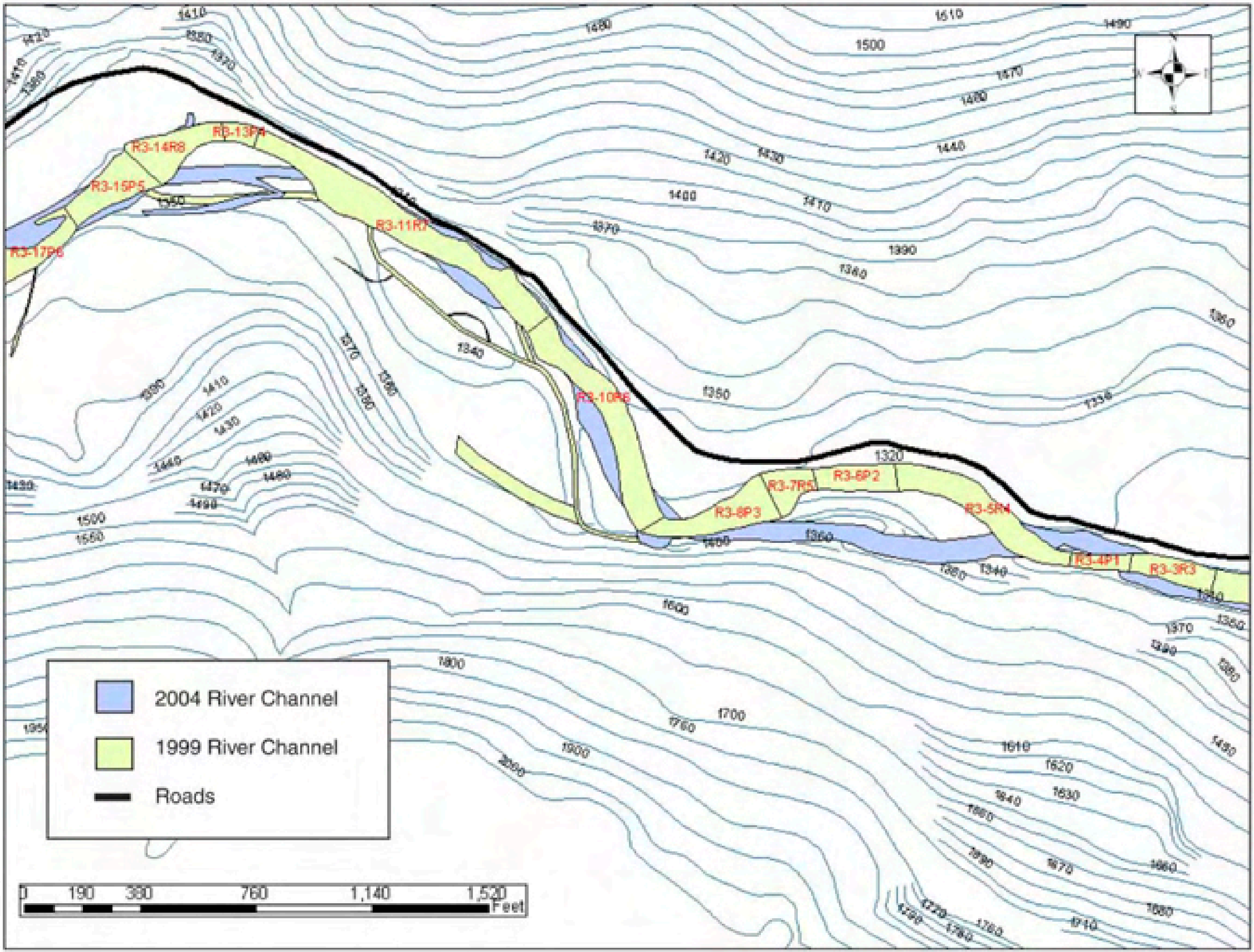


Figure 14
Stehekin River Channels
1999 and 2004, Reach 3

This reach is located in a net transport zone for large woody debris, and contains three logjams (495,554 ft^3). However, repeat surveys of large wood indicate that despite being in a net transport zone, large wood accumulations have increased approximately 1,940 percent between 1984 and 2000.

Habitat in Reach 3 is characterized by a prominent riffle-pool sequence, with six riffles (106,016 ft^2) and five pools (41,645 ft^2). There are also two significant side-channel areas in this reach, covering an area of approximately 44,000 ft^2.

Environmental Consequences

Methodology

The stream flow characteristics analysis assessed potential effects of the proposed alternatives on patterns of stream flow in the Stehekin River. Stream flow characteristics include the magnitude, frequency, duration, timing, and rate of change in flows. Effects assessment was determined through a review of literature on the effects of increases in impervious surfaces on stream flows and discussions with NPS staff.

The reach analysis approach was based on methods developed by Rosgen and Silvey (1998), Pleus and Schett-Hames (1998) and others. A rapid reach assessment protocol developed by Clifford (2003) was used to help assess reach channel stability.

Effect Intensity	Effect Description
Negligible	The alternative could result in a change in stream flow characteristics[1], but the change would be so small that it would not be measurable or perceptible. There would be less than 1% modification of the streambank within the reach.
Minor	The alternative would modify 1-10% of the total streambank within the reach.
Moderate	The alternative would modify 11-30% to the total streambank within the reach.
Major	The alternative would modify greater than 30% of the total streambank within the reach.
Other Qualifiers	**Description**
Beneficial Effect	The alternative would improve stream flow characteristics compared to existing conditions.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

- [1]Stream flow characteristics include magnitude, frequency, duration, timing, and rate of change of flows, habitat, natural sinuosity changes, and large woody debris.

Regulations and Policies

Current laws and policies require that the following conditions related to stream flow characteristics be achieved in the park.

Desired Condition	Source
NPS will perpetuate surface waters as integral components of park aquatic and terrestrial ecosystems.	NPS Management Policies
NPS will manage streams to protect stream processes that create habitat features such as floodplains, riparian systems, woody debris accumulations, terraces, gravel bars, riffles, and pools.	NPS Management Policies
NPS policies recommend setbacks from unstable banks or floodplain areas where possible.	NPS Floodplain Management Guidelines

Impacts of the Alternatives

Alternative 1 - No-Action

Impervious surface in a watershed can alter stream flows because impervious surfaces reduce infiltration of water into the ground and increase surface runoff, often resulting in higher more frequent peak flows and lower baseflows. Currently, there is very little impervious surface within the Stehekin River drainage in the project area upstream of MP 4.0 aside from possibly very small paved areas and roofs associated the small number of residences found there and the Stehekin Valley Road itself (gravel roads are typically considered impervious surfaces). The impervious surface from the road in the project area is approximately 8.9 acres.

Under this Alternative, the stream flow in the Stehekin River would continue to vary according to weather and snow pack, and the natural variation in the movement of the river. Virtually all of the Stehekin River drainage lies within national park or wilderness areas, which are essentially roadless and generally protected from activities that might alter natural flow regimes. The maintenance of the road is not likely to alter flow regimes, unless emergency measures are necessary to keep the road from failing due to riverbank erosion. This could require in-water work including hardening the river bank with riprap or adding stream barbs and bioengineering to control erosion of the riverbank (and the toe of the road slope). This would alter the flow regime in the river and may cause downstream erosion. Considering the effect of past flood events and the likelihood of future flood events, in-water work would be necessary at some point to keep the road from failing. Some potential locations that may require streambank alterations in the future include MP 5.3, MP 7.0, MP 7.5, and MP 8.0.

Alternative 1 may result in minor to moderate long-term, adverse impacts depending on the location and magnitude of riverbank modifications. For example, modification of 10 percent of the total streambank (this would be considered a minor adverse impact) within the three reaches ranges from 300 ft in Reach 3 to 600 ft in Reach 1. Any streambank modifications over those amounts would be considered a moderate adverse impact. It is not unlikely that continued erosion and flood events could result in the need to modify riverbanks up to and over the amounts considered to be minor. It is less likely that it would be necessary to modify greater than 30 percent of the streambank within a given reach (constituting a major adverse impact). This would mean that approximately 1,800 ft, 1,500 ft, and 900 ft for Reaches 1, 2, and 3, respectively would have to be modified before there would be a major adverse impact.

Cumulative Impacts

Alternative 1 would have long-term minor to moderate adverse impacts on stream flow because of the potential need to construct in-water structures. Past projects have resulted in a total of 80 erosion control structures (i.e., cabled logs, rock barbs, riprap or a combination of structures) at 35 sites covering a distance of 4.4 miles on the lower Stehekin River. Thus combining Alternative 1 with other past and future projects would likely result in the construction of additional structures to control erosion. Together these structures would cause changes in stream flow that would be measurable and could have consequences on channel-forming processes and downstream erosion processes. Therefore, the cumulative adverse impact would be moderate and long-term.

Conclusion

Alternative 1 would likely result in additional erosion control structures and streambank modifications, which would cause minor to moderate long-term adverse impacts on stream flow. The cumulative effect of combining Alternative 1 with other projects would result in long-term moderate adverse impacts to stream flow, channel-forming processes, movement of the river through the floodplain, and downstream

erosion processes. However, since there would be no major adverse impact to stream flow characteristics or channel-forming processes, there would be no impairment of the park’s resources or values.

Alternative 2 – Preferred Alternative

Under Alternative 2, the proposed road paving would create approximately one acre of new impervious surface within the drainage, thus there would be a slight increase in impervious surface as compared to Alternative 1 (8.9 acres compared to 9.9 acres). The total drainage area for the Stehekin River is 321 square miles or 205,440 acres. Though some surface runoff from the paved road surface would be expected, particularly near culvert crossings, the amount of new impervious surface is very small compared to the total watershed area. Thus, there would be a negligible adverse impact on stream flow characteristics from the creation of impervious surface.

This alternative would result in streambank modifications at several locations including Wilson Creek (MP 5.3) and MP 8.0. At Wilson Creek adding riprap would modify approximately 400 ft of streambank on the north side of the river. This would increase the percent of controlled streambank in Reach 1 from 73 percent to 80 percent (i.e., modification of 7 percent of the river bank within Reach 1). The riverbank stabilization could increase the rate or location of downstream erosion, which may impact some private properties along the river. The work at Wilson Creek constitutes a long-term, minor adverse impact. A benefit of the proposed bank stabilization is that approximately 400 ft of riverbank would be rehabilitated.

Two to four rock stream barbs would be added at MP 8.0, as well as riverbank rehabilitation. The stream barbs would be placed along the left bank of the river to protect approximately 400 ft of riverbank. This would increase the percentage of riverbank controlled in Reach 3 from approximately 39 percent to 52 percent and result in a long-term, and moderate adverse impact (i.e., modification of approximately 13 percent of streambank within Reach 3). This work may also result in some loss of riffle habitat (approximately 600 ft), but this would be a minor adverse impact because this is the most common type of habitat on the lower Stehekin River. The stream barbs would provide a benefit by creating pool habitat (eddies or “pocket pools” are created upstream and downstream of individual barbs), which is less common on the river. Construction of rock stream barbs could occur under Alternative 1, but this work would be less likely than under Alternative 2. Therefore, Alternative 2 could slightly increase the potential to change in-stream flow characteristics as compared to Alternative 1.

Even though adding the stream barbs at MP 8.0 only affects a relatively small area of riverbank (400 ft), the effect is incremental and continues a trend toward channelization of the river. This is a long-term problem, because while the stream barbs protect the immediate area by deflecting stream flow away from the bank, the altered stream flow can result in streambank erosion farther downstream. In effect, the erosion problem is pushed downstream where it becomes necessary to construct more erosion controls, which causes the river to become more channelized.

Placement of erosion control structures in Reaches 1 and 3 would limit recruitment of large wood by stopping bank erosion. However, there has been an approximately 400 percent and 1,940 percent increase in Reaches 1 and 3, respectively in the amount of large wood in the past 20 years. This indicates that halting new wood recruitment would not greatly affect the total amount of wood in these reaches. Similarly, stabilizing the streambank would reduce gravel recruitment in Reaches 1 and 3. This could result in sediment erosion within the channel and affect other processes of bank erosion and channel avulsion downstream.

Under Alternative 2, the road would be rerouted in several places (Wilson Creek, MP 7.0 and MP 7.5). Relocating the road away from the eroding riverbank would have a beneficial effect as it would prevent the need for additional stream control structures at several points (MP 7.0 and MP 7.5), and allow natural river processes such as river meandering to proceed. It would also reduce the potential for additional

downstream erosion, which could be caused by constructing additional erosion control structures such as rock stream barbs in the river.

Mitigation measures for impacts on stream flow include limiting the duration of the in-stream work as much as possible and time this work to occur at lower flow periods (i.e., work would not occur during heavy river flows). Paving (creation of impervious surface) would also be minimized as much as possible, for example road shoulders would not be paved.

Cumulative Impacts

Overall Alternative 2 would result in long-term, moderate adverse impacts on stream flow, because the proposed construction of the rock stream barbs would modify more than 10 percent of the riverbank within a reach. The two to four rock barbs would have a localized effect of directing the stream away from the riverbank and creating eddies, but would not generally change the overall flow regime in the river. However, other past and present actions have resulted in the construction of 80 control structures. Combined with Alternative 2 there would be 84 erosion control structures, and in the future it is likely that more would be constructed in the river. The cumulative effect of the relatively large number of control devices would be to result in changes in stream flow that were measurable, as well as causing changes that could affect channel-forming processes. Thus, cumulatively there would be long-term, adverse moderate impacts on stream flow.

Conclusion

The addition of two to four stream barbs at MP 8.0 combined with the riverbank work at Wilson Creek under Alternative 2 would have long-term, moderate adverse impacts on stream flow characteristics. The cumulative effect of past, present, and future actions would be to increase the number of control structures and continuing the long-term trend towards channelizing the lower reaches of the Stehekin River. This would result in a cumulative moderate long-term, adverse impact on stream flow.

Relocating the road away from the eroding banks would have beneficial effect as it prevents the need for additional stream control structures, and allows river processes to proceed naturally. In addition, there would be benefits from rehabilitating approximately 800 ft of riverbank. Since there would be no major adverse impact to stream flow characteristics or channel-forming processes, there would be no impairment of the park’s resources or values.

Alternative 3 – Minor Improvements

This alternative would create approximately 0.64 acre of impervious surface over the amount that exists under Alternative 1. Because this is such a minor increase over Alternative 1, there would be negligible adverse impacts on infiltration and runoff, or peak and base flows in the river from road paving.

Compared to Alternative 1, this alternative would add two to four additional erosion control structures (rock stream barbs and bank rehabilitation) in the river at MP 8.0. Similar to Alternative 2, these stream barbs would protect approximately 400 ft of streambank. This would increase the percentage of riverbank controlled in Reach 3 from approximately 39 percent to 52 percent and result in a long-term, and moderate adverse impact.

Similar to Alternative 2, placement of erosion control structures in Reach 3 would limit recruitment of large wood by stopping bank erosion. There has been an approximately 1,940 percent increase in large wood volume in this reach in the past 20 years, thus halting new wood recruitment would not greatly affect the total amount of wood. Similarly, stabilizing the streambank would reduce gravel recruitment in Reach 3. This could result in sediment erosion within the channel and affect other processes of bank erosion and channel avulsion downstream.

The proposed rock stream barbs would also have some localized adverse impacts including loss of riffle habitat and the redirecting of stream flow. The loss of riffle habitat is a negligible adverse impact, because of the abundance of this type of habitat in the river. There would be benefits by the creation of pool habitat, which is a scarcer habitat type in this reach of the river.

In addition to creating pool habitat, this alternative would provide benefits by relocating the road farther away from the river as compared to Alternative 1, thus allowing natural river processes such as channel forming and river meandering to occur. Overall, Alternative 3 would have long-term moderate adverse impacts on stream flow, because it would modify over 13 percent of the riverbank in Reach 3. Mitigation measures would be similar to Alternative 2.

Cumulative Effects

Alternative 3 would result in additional erosion control structures in the river, which would cause long-term moderate adverse impacts. Other projects have resulted in the construction of 80 erosion control structures in the river in the project area and this has also resulted in long-term moderate adverse impacts (future projects would likely add to the total number of structures in the river). The cumulative effect is to continue the trend of channelizing the lower reaches of the Stehekin River and the effects would be moderate, adverse, and long-term.

Conclusion

Alternative 3 would result in long-term, moderately adverse impacts on stream flow because of the addition of erosion control structures in the river (this would modify approximately 13 percent of the streambank within Reach 3). Cumulative adverse impacts would also be moderate and long-term, because there are already a large number of control structures and additional projects are likely to continue adding to this number. As described above, the continuing trend to channelize the river is a concern because the natural river processes (e.g., channel forming, erosion, etc.) are disturbed. Since there would be no major adverse impact to stream flow characteristics or channel-forming processes, there would be no impairment of the park's resources or values.

Alternative 4 –Reroute at MP 7.5

Alternative 4 would add a very small amount of additional impervious surface (0.7 acre) as compared to Alternative 1, thus there would be no appreciable change to infiltration and runoff or peak or base flows.

Similar to Alternative 2, modifications to the riverbank would occur at Wilson Creek (MP 5.3) and MP 8.0. At MP 5.3 riprap would be added to the riverbank, thus modifying approximately 400 ft of riverbank on the north side of the river. This would modify 7 percent of the riverbank within Reach 1. The riverbank stabilization could increase the rate or location of downstream erosion, which may impact some private properties along the river. The work at Wilson Creek constitutes a long-term, minor adverse impact. A benefit of the proposed bank stabilization is that approximately 400 ft of riverbank would be rehabilitated. Alternative 4 would add two to four rock stream barbs at MP 8.0 to protect approximately 400 ft of riverbank. This would modify approximately 13 percent of streambank within Reach 3 (increasing the percentage of controlled streambank from approximately 39 percent to 52 percent).

In addition to the erosion control structures and riverbank stabilization described above, Alternative would also construct rock stream barbs and bioengineering at MP 7.0. This work would occur instead of rerouting the road as proposed under Alternatives 2 and 3. At MP 7.0 (Reach 2), Alternative 4 would place 4 rock stream barbs along 900 ft of streambank. This would result in an increase in the number of erosion control structures and modification of approximately 18 percent of the streambank within Reach 2.

As with Alternatives 2 and 3, placement of the erosion control structures in Reaches 1, 2, and 3 under Alternative 4 would limit recruitment of large wood by stopping bank erosion. Since there has been an approximately 400 percent, 1,890 percent, and 1,940 percent increase in large wood volume in Reaches 1, 2, and 3, respectively during the recent past, halting new wood recruitment in these reaches would not greatly effect the total amount of wood. Stabilizing the riverbank would also reduce gravel recruitment in Reaches 1, 2, and 3. This alternative would have a greater affect on reducing gravel recruitment than any of the other alternatives, because of larger area of riverbank stabilization. Thus, Alternative 4 is more likely to result in wider spread erosion within the channel and downstream channel avulsion.

Beneficial effects from installation of rock stream barbs and bioengineering would be the rehabilitation of approximately 1,700 ft of eroding riverbank. Another benefit would be the creation of pool habitat in Reaches 2 and 3 (Reach 2 had no pools and Reach 3 had only 5 pools based on a stream survey performed in 2000 by NPS). The rock stream barbs would be placed in the riffle zones along the left bank of the river, which would result in the loss of approximately 1,350 ft of riffle habitat. Similar to Alternatives 2 and 3, this lost riffle habitat would be replaced with less common pool habitat, which is beneficial to fish.

Compared to Alternative 1, this alternative would result in both adverse and beneficial effects on stream flow that would not generally occur under Alternative 1. It is anticipated that Alternative 1 may result in additional erosion control structures, but would likely result in less streambank modifications compared to Alternative 4 (i.e., Alternative 1 is likely to have less than 1,700 ft of riverbank modification that would occur under Alternative 4). Alternative 4 is likely to result in more benefits than Alternative 1, because more desirable stream habitat (pool habitat) would be developed and there would be more rehabilitation of eroding riverbank.

Alternative 4 would cause long-term changes in stream flow characteristics because of the construction of relatively permanent erosion control structures in the Stehekin River and on its riverbank. The changes in stream flow are likely to have a moderate adverse impact on channel forming processes as the trend towards channelizing the river continues. Mitigation measures would be similar to Alternative 2.

Cumulative Impacts

Alternative 4 would construct an additional 7 erosion control structures in the river, as well as rehabilitating approximately 1,700 ft of riverbank. Other past projects have resulted in construction of 80 erosion control structures and it is likely that future projects would add to this total number. This alternative would also increase the length of controlled shoreline by 1,700 ft. The combined number of structures controls a fairly large segment of the lower Stehekin River. Thus, the cumulative adverse impact on stream flow is moderate and long-term.

Conclusion

Alternative 4 would result in long-term, moderately adverse impacts on stream flow because of the addition of erosion control structures in the river and modification of approximately 7 percent, 18 percent, and 13 percent of the riverbank in Reaches 1, 2, and 3, respectively). Cumulative adverse impacts would also be moderate and long-term, because there are already a large number of control structures and additional projects are likely to continue adding to this number. As described above, the continuing trend to channelize the river is a concern because the natural river processes (e.g., channel forming, erosion, etc.) are disturbed. However, since there would be no major adverse impact to stream flow characteristics or channel-forming processes, there would be no impairment of the park's resources or values.

WILD AND SCENIC RIVERS

Affected Environment

This section describes the characteristics of the Stehekin River that contribute to the river's eligibility for listing as a component of the National Wild and Scenic Rivers System (National System). In May 2002 the NPS completed the *Stehekin River Wild & Scenic River Eligibility Report* (NPS 2002). This section uses information from that report in considering the potential impacts of the proposed project on the river's eligibility for inclusion in the National System.

The Wild and Scenic Rivers Act (WSRA) defines three classes of national wild and scenic rivers:

> Wild river areas – Those rivers or section of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and with unpolluted water. These represent vestiges of primitive America.
>
> Scenic river areas – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> Recreational river areas – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Because levels of human activity and development are not uniform throughout the Stehekin River watershed, the Eligibility Report segmented the river in order to consider appropriate classifications for each segment. Segment 1 in the report extends from the river's mouth at Lake Chelan and ends at High Bridge, a length of approximately 11 miles. Segment 1 encompasses the entire proposed project area discussed in this EA. Because of disturbance to the riverbank, the presence of houses, businesses, powerlines, and other human development, the Eligibility Report recommended a classification of "recreational" for Segment 1.

In Segment 1, the first quarter mile of the river's tributaries, (except for Company Creek) from their confluence with the river, would be classified as "recreational." The rest of those tributaries' lengths would be classified as "wild." The first half mile of Company Creek would be classified as "recreational." All tributaries above Segment 1 would be classified as "wild."

Segment 2 is upstream of the proposed project area, from High Bridge to Cottonwood Campground, a length of roughly 12 miles. There is very little human development or alteration along this segment of the river, but because a road parallels much of its length, the Eligibility Report recommended a classification of "scenic."

Segment 3 extends approximately 6 miles upstream from Cottonwood Campground to the river's headwaters. There is very little evidence of human activity along Segment 3, so the Eligibility Report recommended a classification of "wild."

Wild and Scenic Characteristics of the Stehekin River

This section discusses those elements which constitute the wild and scenic characteristics of the Stehekin River. The Act identifies the characteristics that qualify rivers as eligible for inclusion in the National System as a river or river segment that: (1) is free-flowing, as determined by standards set by the Departments of the Interior and Agriculture; and (2) possesses one or more resources of *outstandingly*

remarkable value (ORV) to the region or nation, such as exceptional scenery, recreational opportunities, geology, fisheries, wildlife, prehistoric values, or cultural heritage.

Free-flowing

Free-flowing, as applied to "any river or section of a river," is defined in section 16(b) of the WSRA as:

> *"…existing or flowing in natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures…shall not automatically bar its consideration for inclusion: provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the National Wild and Scenic Rivers System."*

The Eligibility Report indicates that river flow in Segment 1 is primarily natural, with existing modifications that are well within the standards for a wild and scenic river. Segment 1 of the Stehekin River exhibits some level of channel modification or restriction, but the intrusions are generally unobtrusive and of short length. Existing channel modifications intended to protect the main road or private property include 80 erosion control structures, such as cabled logs, riprap, rock barbs, or a combination of structures, at 35 sites in Segment 1. A vehicular bridge spanning the Stehekin above Harlequin Campground also alters the channel. Some tributaries flowing into Segment 1 are crossed by vehicular bridges. Several tributaries also have intakes for small irrigation systems. The intakes have very little impact on stream flow.

Segment 2 has almost no river flow restrictions. Aside from two bridge crossings and several hundred feet of riprap, river flow in this section is natural. Vehicular bridges cross two tributaries along Segment 2.

Segment 3 has natural river flow, with no modifications. Tributaries along Segment 3 are crossed only by foot bridges.

Outstandingly Remarkable Values

All segments of the Stehekin River support or exhibit the ORVs as discussed in the Eligibility Report. The ORVs identified in the report include wildlife, fish, prehistoric resources, historic resources, geology, scenic resources, and recreation. A description of how these qualify as ORVs under the WSRA is discussed below.

The Stehekin River and its valley support a great diversity of game and nongame wildlife and fish species, and provide or potentially provide habitat for many species of special interest including threatened and endangered species. Many of these species are dependent upon the Stehekin River for some or all of their life cycle and the river is an important habitat component and migration route. Thus, fish and wildlife are ORVs associated with the Stehekin River.

Where there is evidence of prehistoric resources (occupation or use by Native Americans) in the river or river corridor and these resources have rare or unusual characteristics or exceptional human interest value, then these constitute an ORV. Since the early 1980's, NPS has performed an inventory of approximately 5 percent of the NOCA complex (684,000 acres). Even though only a relatively small area has been surveyed, over 250 pre-contact (resources associated with Native Americans before the time of contact with European settlers – approximately 1850) archaeological sites have been documented with some of these in the Stehekin River valley. For example, there are 33 archeological sites recorded in the Lake Chelan Recreation NRA and of these sites, 25 are prehistoric. Flake tools and unmodified flakes dating

3,000 years ago have also been found in this area. In view of that, the abundance and importance of the prehistoric resources in the Stehekin Valley qualify as an ORV under the WSRA.

Historic resources include several sites listed in the National Register of Historic Places, and several more sites that are eligible for nomination. As a result, historic sites or features generally over 50 years in age that signify an important event, person, or cultural activity are categorized as an ORV under the WSRA. For example, historic resources within the Stehekin River Valley's three designated historic districts include log cabins, shelters, lookouts, mines, hostelries, and other structures built during the early exploration, settlement, commercial development, and federal management of the Stehekin Valley.

The geology of the Stehekin Valley includes excellent textbook examples of glacial features and processes, such as glaciers, ice fields, cirques, spires, hanging valleys, and bedrock box canyons. The Golden Horn batholith is the only true granite found in the North Cascades and is a feature unique to the watershed. For these reasons, the geology of the Stehekin Valley was found to be an ORV under the WSRA.

Scenic resources include a landscape dominated by dramatic glacially sculpted landforms, diverse vegetation, and exceptionally clear flowing water. Human impacts are few and unobtrusive, allowing the visitor to experience the grandeur of the wilderness. Though subjective in nature, the quality of the scenery and natural landscape qualify scenic resources as an ORV under the WSRA.

In order for a recreational resource to be considered an ORV, it must be or have the potential to be unique enough to attract visitors from outside of the geographic region to use the river resources for recreational purposes. This is definitely the case for the Stehekin River, as it is difficult to access this area and visitors must make a concerted effort since the area is not directly accessible by vehicle. Visitors come to the Stehekin Valley to sightsee, photograph, camp, hike, boat, and swim in the Stehekin River. Thus, recreation resources qualify as an ORV under the WSRA.

Environmental Consequences

Methodology

The wild and scenic rivers analysis assesses potential effects of the proposed alternatives on the characteristics of the Stehekin River that contribute to the river's eligibility for listing as a component of the National System. Those characteristics include the free-flowing nature of the river and the ORVs provided by the river and its immediately surrounding lands. As noted above, the ORVs for the Stehekin River are wildlife, fish, prehistoric resources, historic resources, geology, scenic resources, and recreation. The impact intensity definitions for wild and scenic rivers are listed below.

Effect Intensity	Effect Description
Negligible	The effect on the values for which the river segment was determined eligible for listing as a wild and scenic river would be at the lowest levels of detection; barely measurable with no perceptible consequences, either adverse or beneficial.
Minor	A perceptible effect would occur to the values for which the river segment was determined eligible for listing as a wild and scenic river; but the effect would be localized to relatively small areas. Little, if any, loss of value or integrity would occur.
Moderate	A readily apparent effect would occur to the values for which the river segment was determined eligible for listing as a wild and scenic river. The effect would diminish some of the values, but not enough to threaten the river's listing in the National Wild and Scenic Rivers System.
Major	A readily apparent effect would occur to the values for which the river segment was determined eligible for listing as a wild and scenic river. The effect would be severe enough to threaten the river's listing in the National Wild and Scenic Rivers System.

Other Qualifiers	Description
Beneficial Effect	The alternative would improve wild and scenic river characteristics compared to existing conditions.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to wild and scenic rivers be achieved in the park.

Desired Condition	Source
Must protect the free-flowing condition and outstandingly remarkable values of designated rivers and congressionally authorized study rivers. Requires analysis and documentation if there would be any impact on a designated or potential wild and scenic river.	Wild and Scenic Rivers Act: Section 7
No management actions may be taken that could adversely affect the values that qualify a river for inclusion in the National Wild and Scenic Rivers System.	NPS Management Policies

Impacts of the Alternatives

This section only addresses Segment 1 of the Stehekin River, because there would be no impacts from the proposed project on Segments 2 and 3 and all project activities would occur within Segment 1.

Alternative 1 – No-Action

Free Flowing

Under Alternative 1, maintenance of the Stehekin Valley Road is not likely to alter the free flowing characteristic of the Stehekin River. The only exception would be in the event of a major flood that results in damage to the road and the need to make emergency repairs. If emergency repairs included streambank or in-water work to support the road, then there is the potential to have some effect on stream flow. Considering past flood events, it is likely that there could be some need to construct erosion control features such as rock riprap or stream barbs to protect the road. Thus, Alternative 1 could result in minor to moderate, long-term, adverse impacts on the free flowing characteristics of the river depending on the location and magnitude of the necessary riverbank modifications (see the Stream Flow Characteristics section of the EA for additional discussion).

Outstandingly Remarkable Values

Wildlife: Wildlife would be adversely affected depending on location, timing, intensity, and duration of maintenance activities or emergency road work under Alternative 1, as well as the species. Wildlife activities such as nesting, foraging, or other behavior would be adversely affected temporarily by noise, dust, and increased human activity associated with road repair and maintenance work. Smaller species, such as snakes and lizards, may be killed because they are less able to rapidly escape the area during repair activities. Removal or alteration of habitat would be a long term adverse impact (for example in the event of major road repair associated with emergency repair work). The potential impacts on most wildlife would be long-term, negligible to minor, and adverse.

There is one threatened and endangered wildlife species located in the vicinity of the project: northern spotted owls. As a result, road repair and maintenance work in certain sensitive areas could disturb nesting owls. However, no construction would be allowed in these sensitive areas during the breeding and nesting season. Foraging owls may avoid the vicinity of road repair work, but adequate foraging habitat would still be available. Impacts to northern spotted owls would be short-term, moderate, and adverse.

Fish: Fish could be affected by any continued erosion of road materials into the river. Increased sediment can adversely impact spawning habitat and alter other water quality parameters such as turbidity, dissolved oxygen, and biological oxygen demand. However, in comparison to the total sediment load in the river, the potential sediment from the Stehekin Valley Road is very small, and sediment from the road would rapidly dissipate. Overall, the adverse impact on fish from Alternative 1 would be negligible and short-term.

Prehistoric Resources: Generally there would be no impact on prehistoric resources from Alternative 1, because no known prehistoric resources would be affected. An archaeological survey conducted in June 2004 located no prehistoric sites in or near the proposed project area. However, there is some slight potential for an unknown archaeological resource to be present in the project area.

Historic Resources: Historic resources would not be affected by Alternative 1, because there are no historic structures within the proposed project area.

Geology: Under Alternative 1, geology would be largely unaffected, unless there was a need for an emergency road repair that required cuts into existing slopes. Generally, there would be some negligible impact from removal of gravel material from the Company Creek gravel pit for road repair and maintenance (thus affecting the geology in the gravel pit area). The Lake Chelan Sand, Rock, and Gravel Plan and Lake Chelan NRA GMP limit the use of gravel from this source to 1,200 cubic yards per year. However, the Park Superintendent can authorize increased use for emergency repair needs. The Lake Chelan Sand, Rock, and Gravel Plan reports an average of 2,800 cubic feet of material have been removed annually from the gravel pit since 1948. The long-term adverse impact of removing that amount of material would be negligible.

Scenic Resources: Short-term, minor, adverse impacts would occur from the noise and degraded views associated with road repair and maintenance activities (including construction in the event of emergency road repairs) under Alternative 1. There may be some minor modifications to landscape elements such as vegetation if the road requires rerouting due to flooding and clearing of vegetation is necessary. Wildlife viewing opportunities would also be temporarily affected due to road work such as grading and filling potholes and spreading gravel.

Recreation: Recreation activities potentially affected by Alternative 1 include hiking/backpacking, horseback and bicycle riding, rafting, guided shuttle tours, nature viewing, and sightseeing, among others. Under Alternative 1, periodic repair and maintenance work to the Stehekin Valley Road would occur and could adversely affect some recreational activities by generating dust, noise, decreasing visual quality, and affecting travel time through the area. Road closures caused by flooding would prevent access to part of the Park, until repairs were completed. Thus impacts on recreation would be short-term, adverse, and minor.

Cumulative Impacts

Free Flowing

There are 80 erosion control structures at 35 locations within Segment 1 of the Stehekin River from past projects. Unless emergency road repairs were required that included construction of additional erosion control structures, there would be no impact on the free flowing character of the river under Alternative 1. However, given the frequency and magnitude of recent flood events, it is likely that additional erosion control structures would be required at some point in the future to protect the road. In addition other future projects could also involve riverbank stabilization measures that could affect the river's flow characteristics. Combined, Alternative 1 and other past, present, and future projects would have cumulative moderate and long-term adverse impacts on the free-flowing characteristics of the river.

Outstanding Remarkable Values

Wildlife: Generally, other past, present, or future actions including Alternative 1 have the potential to cause impacts to wildlife, including threatened and endangered species and other species of concern. In the Stehekin Valley, the impacts are mostly the result of construction activities associated with repair and maintenance of the Stehekin Valley Road and the Forest Fuel Reduction Program. Road repair and maintenance cause temporary wildlife disturbance by generating noise and dust, and increase human activity in the area. There also may be some short or long–term alteration of localized habitat conditions.

The Forest Fuel Reduction Program is an on-going action that would continue to impact wildlife and habitat. Species are disturbed by fire, smoke, and human activity and are likely to avoid the area of a prescribed burn either temporarily or permanently. The program also reduces or alters habitat in the burn areas. That activity could result in short-term and long-term moderate adverse impacts on wildlife.

When the impacts of Alternative 1 are combined with the impacts of other past, present, and foreseeable future actions, cumulative impacts to wildlife would be short and long-term, moderate, and adverse.

Fish: Past, present, and future actions including Alternative 1, would result in short-term, negligible, and adverse impacts. Impacts to fish would result from erosion of the road or road side slopes causing increased sedimentation. Sediment can alter water quality parameters that affect fish as well as cause other impacts to respiration and spawning as described previously.

The Forest Fuel Reduction Program may also affect fish. Although unlikely, in the event that a prescribed burn becomes uncontrolled, riparian vegetation that shades the river could be burned to the extent that stream temperatures rise. This could adversely affect fish at least in the short-term. Ash from a large fire may also be deposited in the river and affect water quality. However, as with other species, fish have evolved in response to periodic disturbance by fire and it is reasonable to assume that they would persist. To the extent possible, the forest fuel management program would avoid prescribed fires in the vicinity of the river during the fish spawning season. This program may also result in long-term beneficial effects to fish by increasing the nature and extent of woody debris in streams and rivers.

Overall, cumulative impacts to fish from past, present, and future road projects and from the Forest Fuel Reduction Program, when combined with Alternative 1, would be negligible, short-term, and adverse.

Prehistoric and Historic Resources: There would be no cumulative impacts because Alternative 1 would have no impacts to these ORVs, thereby not contributing incrementally to the impacts of other actions.

Geology: The National Park Service and local residents have used an average of about 2,800 cubic yards of material per year from the Company Creek gravel pit since 1948. Most was used to repair erosion-damaged roads and bridges. The impacts of past, present, and future gravel pit use, in combination with the impacts of pit use for Alternative 1, would result in long-term, negligible, adverse cumulative impacts to geology.

Scenic Resources: Alternative 1, other past, present and future road repair projects, and the Forest Fuel Reduction Program would contribute to adverse impacts to scenic resources. Road repair projects and the forest fuels program have created and would continue to create short-term minor adverse impacts such as decreasing the visual appeal of scenic resources by generating dust and noise, increasing the presence of road repair and construction equipment, and from creating burned areas. In particular, burned areas may be perceived as unattractive to visitors unfamiliar with the benefits derived from controlled fires. Overall, the impacts of past, present, and reasonably foreseeable future projects, in combination with the impacts of Alternative 1, would result in short and long-term minor adverse cumulative impacts.

Recreation: For recreational resources, other past, present, and future projects have created or would continue to create adverse effects most of which are short-term. These impacts are generally minor and result from increased dust and noise, decreased visual quality, and limited access caused by road repair and maintenance and the Forest Fuel Reduction Program. In the event of a road closure due to flooding, some recreational activities could be adversely affected for an extended period of time such as shuttle tours. Overall, the cumulative impacts of past, present, and reasonably foreseeable future projects in combination with the impacts of Alternative 1, would result in short and long-term minor adverse impacts.

Conclusion

Alternative 1 would have long-term minor to moderate adverse impacts on the free-flowing characteristics of the Stehekin River. Alternative 1 would have varied impacts on the river's ORVs. There would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have short-term moderate adverse impacts. For the other ORVs, the impacts can be summarized as follows: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.

Cumulative adverse impacts related to the WSRA would include: long-term and moderate for the Stehekin River's free flowing characteristics; short to long-term and moderate for wildlife; short-term and negligible for fish; long-term and negligible for geology; and short and long-term and minor for scenic resources and recreation. There would be no cumulative impacts on prehistoric or historic resources.

Since there would be no major adverse impact to the Stehekin River's eligibility for listing as a component of the National Wild and Scenic River System or impact on free flowing characteristics or outstandingly remarkable values, there would be no impairment of the park's resources or values.

Alternative 2 – Preferred Alternative

Free Flowing

Streambank modifications would occur at Wilson Creek (MP 5.3) and MP 8.0 under Alternative 2. At Wilson Creek riprap would be added to stabilize approximately 400 feet of riverbank. This would increase control of the riverbank in this area from 73 to 80 percent. At MP 8.0, two to four rock stream barbs would be constructed increasing the amount of controlled riverbank in this area from 39 to 52 percent. The stream barbs would redirect stream flow, which may alter the flow conditions of the river, by

changing bank and sediment erosion and channel avulsion processes. These changes have the potential to result in long-term, moderate adverse impacts on the free flowing characteristics of the river. Construction of rock stream barbs could also occur under Alternative 1, but this work would be less likely than under Alternative 2. Therefore, Alternative 2 could slightly increase the potential to change the free flowing characteristics of the river as compared to Alternative 1 (see the Stream Flow Characteristics section of the EA for additional discussion).

Under Alternative 2, the road would be rerouted at Wilson Creek, MP 7.0, and MP 7.5. Relocating the road away from the eroding riverbank would have a beneficial effect by eliminating the need for additional stream control structures and allowing natural river processes such as the river's free flowing characteristics to be preserved.

Outstandingly Remarkable Values

Wildlife: Generally, adverse impacts to species and habitat resulting from Alternative 2 would be similar to Alternative 1. Under Alternative 2, there would be a long-term, minor adverse impact from the loss of approximately 10 acres of upland habitat (some of this would be replaced by rehabilitating abandoned road sections at the reroute locations). This loss of habitat would generally not occur under Alternative 1, except in the event of an emergency road repair. Short-term, negligible to minor adverse impacts to wildlife (depending on the species – see the Wildlife and Threatened and Endangered Species section of the EA for additional discussion) would be caused by construction activities such as increases in noise, dust, and human activity. These construction activities have the potential to disturb wildlife causing behavioral changes including avoidance of the area and disruptions to nesting.

Construction related disturbances could have a short-term moderate adverse impact on northern spotted owls, because an owl may be located in the vicinity of the project. The project could have the effect of moving the road closer to a potential nesting site, resulting in a long-term moderate adverse impact. This impact would generally not occur under Alternative 1 unless the road needed to be relocated in an area where there was a nest site. Mitigation for Alternative 2 has been developed to avoid impacting the nest site during construction (see the Wildlife and Threatened and Endangered Species section of this EA). Alternative 2 would also produce some beneficial effects on wildlife by rehabilitating habitat along the riverbank and in the abandoned road sections.

Fish: Compared to Alternative 1, Alternative 2 has an increased potential to cause adverse impacts to fish, because there would be in-water and bank stabilization work under this alternative that generally would not occur under Alternative 1. This includes bank stabilization at Wilson Creek (MP 5.3) and in-water work at MP 8.0. This may increase short-term sediment loading into the Stehekin River. However, this adverse impact would be minor in effect because the stream flow would rapidly dissipate any sediment.

Alternative 2 would also provide several benefits to fish by creating pool habitat, which is more scarce than other habitat types (such as riffle habitat), and providing additional riparian vegetation along the riverbank (such as willow layering to provide shade and woody debris). Once the road was paved there would be less sediment eroding from the road and slope stabilization measures should also help to reduce the amount of eroded sediment entering the river. Thus, overall water quality and habitat for fish would be improved.

Prehistoric Resources: Generally there would be no impact on prehistoric resources from Alternative 2, because no known prehistoric resources would be affected. An archaeological survey conducted in June 2004 located no prehistoric sites in or near the proposed project area. However, there is some slight potential for an unknown archaeological resource to be present in the project area.

Historic Resources: Historic resources would not be affected by Alternative 2, because there are no historic structures within the proposed project area.

Geology: The geology of the area would be slightly affected under Alternative 2. There would be some slope cuts or slope laybacks and road reroutes at Wilson Creek (MP 5.3), MP 6.0, MP 7.0 and MP 7.5 (these generally would not occur under Alternative 1). These adverse impacts would be long-term, but negligible in intensity. Most of the material to be used in the road construction, including base course for the road sub-base, aggregate material, and rock would be barged into Stehekin. Some gravel might be taken from the Company Creek gravel pit to repair some of the flood damaged areas. Paving the road would reduce the future need for gravel to maintain the road, thus reducing the potential effect on the geology of the Company Creek gravel pit as compared to Alternative 1. Overall, impacts to geology would be long-term, negligible, and adverse.

Scenic Resources: Generally impacts (i.e., minor, short-term adverse impacts) on scenic resources from road construction (i.e., noise, dust, increased human activity, etc.) under Alternative 2 would be much the same as those for Alternative 1, except that there would be fewer periodic road repair projects, because of the improvements made to Stehekin Valley Road. However, Alternative 2 would alter scenic elements of the landscape at the two road reroutes (MP 7.0 and MP 7.5), which would not occur under Alternative 1. Landscape elements would be altered long-term and include clearing vegetation, introducing views of a paved road, and moving the road farther from the river and thus potentially changing foreground and background views from the road. In terms of views, these changes may be seen as positive or negative depending on the viewer. Alternative 2 would result in short and long-term, minor adverse impacts.

Recreation: Impacts on recreation would be much the same as for Alternative 1, except that Alternative 2 would create fewer impacts over time, because there would be less need for periodic roadway repairs. Construction work on Stehekin Valley Road would adversely affect some recreational activities temporarily by generating dust and noise, decreasing visual quality, and preventing or disrupting access to other parts of the Park. Another possible impact on recreation would be from the installation of rock stream barbs. The rock stream barbs would constitute a minor hazard to river rafters by creating an obstruction in the channel. The obstruction would be topped during high flow periods in the spring and early summer, when floating the river is most popular. Later in the summer, however, the structure would protrude above the water surface, although the effects would likely have no greater impact to recreation than other obstacles along the river (Allen 2005). Collectively, impacts to recreation under Alternative 2 would be short-term, minor, and adverse.

<u>*Cumulative Impacts*</u>

Free Flowing

There are 80 erosion control structures at 35 locations within Segment 1 of the Stehekin River from past projects. Alternative 2 would result in 2–4 additional in-water structures at MP 8.0, as well as bank stabilization at MP 5.3. This would increase control of the river in the MP 8.0 area by 13 percent and by 7 percent in the MP 5.3 area (refer to the Stream Flow Characteristics section of the EA for additional discussion). In addition other future projects could also involve riverbank stabilization measures that could affect the river's flow characteristics. These structures would produce long-term changes to the flow characteristics of the river. Thus, Alternative 2, when combined with other past, present, and future projects, would have cumulative moderate and long-term adverse impacts on the free-flowing characteristics of the river.

Outstanding Remarkable Values

Wildlife: Generally, other past, present, or future actions have the potential to cause additional impacts to wildlife, including threatened and endangered species and other species of concern. In the Stehekin Valley, the impacts are mostly the result of construction activities associated with the Stehekin Valley road and to the Forest Fuel Reduction Program, which includes some long-term habitat loss and alteration. When the impacts of Alternative 2 are combined with all past, present and reasonably foreseeable future actions, the cumulative effects would be short and long-term moderate, and adverse.

Fish: Cumulative impacts to fish from Alternative 2 would be much the same as those for Alternative 1. Past, present, and future road repair projects and the Forest Fuel Reduction Program would affect fish through habitat alteration and short-term reductions in water quality as described above. Overall, cumulative impacts to fish would be negligible, short-term, and adverse.

Prehistoric and Historic Resources: There would be no cumulative impacts because Alternative 2 would have no impacts to these ORVs, thereby not contributing incrementally to the impacts of other actions.

Geology: There would be some slight long-term adverse affect from Alternative 2 on the geology of the area because of the need to cut into slopes. Other projects have or could also require disturbance to the geology of the area. However, since there is very little development that has occurred or is proposed in the project area, geology would remain largely untouched.

There could be some short-term increased use of gravel from the Company Creek pit if gravel from the pit is used to construct Alternative 2. However, it is more likely that over time less material would be needed to maintain the road because the road would be paved. If the road improvements proposed for Alternative 2 were implemented, impacts on the geologic resources of the Stehekin Valley would be lessened, because there would be a lower demand for road repair materials. Under Alternative 2, the cumulative adverse impacts on geology would be long-term, but negligible.

Scenic Resources: Other past present and future road repair projects, the Forest Fuel Reduction Program, construction of the road reroutes, and clearing under Alternative 2 would create adverse impacts to scenic resources (some of these could also be viewed as beneficial). Collectively, road repair and construction and prescribed burning and thinning have created and would create short and long-term minor adverse impacts on scenic resources. Short-term adverse impacts are the result of burning, generating noise and dust, and temporarily increasing human activity. Long-term adverse impacts would result from road reroutes, vegetation clearing and thinning, and paving the Stehekin Valley Road, which would alter views (altered views may be perceived as positive or negative depending on the viewer). Overall, the impacts of past, present, and reasonably foreseeable future projects, in combination with the impacts of Alternative 2, would result in short and long-term, minor adverse cumulative impacts.

Recreation: The cumulative adverse impacts on recreation would be mostly short-term resulting from construction activities and the Forest Fuel Reduction Program. These impacts include causing noise, dust, decreased visual quality, and limiting access to other parts of the Park. The exception to this is if flooding were to damage the road in such a way that access to other parts of the Park was not possible for an extended period of time. This would be a long-term effect. Thus, the effects of other past, present and future actions combined with Alternative 2 would cause short and long-term, minor adverse cumulative impacts.

Conclusion

Alternative 2 would have a long-term, moderate, adverse impact on the free-flowing characteristic of the Stehekin River. Regarding the impacts on ORVs, there would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, the impacts can be summarized as follows: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.

Cumulative adverse impacts related to the WSRA would include: long-term and moderate for the Stehekin River's free flowing characteristics; short to long-term and moderate for wildlife; short-term and negligible for fish; long-term and negligible for geology; and short and long-term and minor for scenic resources and recreation. There would be no cumulative impacts on prehistoric or historic resources.

Since there would be no major adverse impact to the Stehekin River's eligibility for listing as a component of the National Wild and Scenic River System or impact on free flowing characteristics or outstandingly remarkable values, there would be no impairment of the park's resources or values.

Alternative 3 – Minor Improvements

Free Flowing

Under Alternative 3, two to four erosion control structures (rock stream bars and bank rehabilitation) would be constructed at MP 8.0 similar to Alternative 2 (however, there would be no bank control work at MP 5.3). The erosion control structures would result in increased control of the riverbank in this area from 73 to 80 percent. The free flow conditions of the river in this area would be altered by the control structures. These can change bank and sediment erosion and channel avulsion processes and this has the potential to result in long-term, moderate adverse impacts on the free flowing characteristics of the river. Construction of rock stream barbs could also occur under Alternative 1, but this work would be less likely than under Alternative 3. Therefore, Alternative 3 could slightly increase the potential to change the free flowing characteristics of the river as compared to Alternative 1 (see the Stream Flow Characteristics section of the EA for additional discussion).

Similar to Alternative 2, the road would be relocated farther away from the river in several areas under Alternative 3 (at MP 7.0 and 7.5). This would benefit the free flowing conditions in the river because this would reduce the need for constructing erosion control structures to protect the road from flood and erosion damage. However, as compared to Alternative 2, Alternative 3 has fewer and shorter road reroutes, so it would be slightly less effective at providing this benefit.

Outstandingly Remarkable Values

Wildlife: Potential impacts to wildlife would be similar to Alternatives 1 and 2. Under Alternative 3 there would be long-term, minor adverse impact from the loss of approximately 9 acres of upland habitat. This would be a minor impact because of the abundance of similar habitat in the vicinity. There would also be some replacement of lost habitat from rehabilitating the abandoned road sections. However, the loss of 9 acres of upland habitat generally would not occur under Alternative 1 unless there was the need for emergency road repairs that required a similar amount of clearing. Thus, Alternative 3 has a slightly greater potential to result in a loss of habitat. Alternative 3 would also produce some beneficial effects on wildlife by rehabilitating habitat along the riverbank and in the abandoned road sections.

Under Alternative 3, there would be short-term, negligible to minor adverse impacts to most wildlife (depending on the species – see the Wildlife and Threatened and Endangered Species section of the EA for additional discussion), because of construction related disturbances such as increased noise, dust, and human activity. Wildlife may avoid the area or respond with other behavioral changes because of the increased disturbance. These impacts would be similar to those resulting from Alternative 1.

The impact on the northern spotted owl would be short and long-term, moderate, and adverse. Construction activities for Alternative 3 would cause temporary, minor adverse impacts from increases in noise, dust, and human activity lasting for the duration of construction. Moving the road closer to the potential spotted owl nest site would result in long-term moderate adverse impacts. Alternative 3 would have slightly greater potential to adversely affect northern spotted owls than Alternative 1.

Fish: Similar to Alternative 2, Alternative 3 would result in short-term, negligible, adverse impacts to fish that likely would not occur under Alternative 1, because of the proposed in-water work at MP 8.0. Although Alternative 3 would not provide any bank stabilization in the Wilson Creek area, it would still involve adding 2 to 4 erosion control structures in the river. This would increase the likelihood that water quality will be temporarily impacted. In addition, there may be a slightly higher chance under Alternative 3 that there would be a slope failure at Wilson Creek as compared to Alternative 2 because there would be no stabilization work in this area. A slope failure could result in additional sediment loading into the river, producing temporary adverse impacts on fish. However, the volume and speed of the water in the Stehekin River would generally flush any additional sediment within a relatively short period. Thus, the adverse impacts on fish from changes in water quality or increased sediment would be short-term and negligible. Alternative 3 would also produce some beneficial effects on fish by rehabilitating habitat along the riverbank.

Prehistoric Resources: Generally there would be no impact on prehistoric resources from Alternative 3, because no known prehistoric resources would be affected. An archaeological survey conducted in June 2004 located no prehistoric sites in or near the proposed project area. However, there is some slight potential for an unknown archaeological resource to be present in the project area.

Historic Resources: Historic resources would not be affected by Alternative 3, because there are no historic structures within the proposed project area.

Geology: The geology of the area would be affected under Alternative 3, although it would be less than under Alternative 2 because there would be no work at Wilson Creek (MP 5.3) and a shorter reroute at MP 7.5. However, Alternative 3 would still result in some slope cuts and road reroutes at MP 7.0 and MP 7.5, which as compared to Alternative 1 would generally not occur. These adverse impacts would be long-term, but negligible in intensity. Similar to Alternative 2, material to construct the road under Alternative 3 would mostly be imported from outside the Stehekin Valley. There may be some slight amount of gravel taken from the Company Creek gravel pit to repair some of the flood damaged areas. However, this alternative would provide a benefit because paving the road would reduce the future need for gravel from the Company Creek gravel pit. Overall, impacts to geology would be long-term, negligible, and adverse.

Scenic Resources: Under Alternative 3, scenic resources would be affected by road construction similar to what would occur under Alternative 1. However, long-term impacts would be reduced as compared to Alternative 1 because the road would be paved reducing the need to maintain the road and lessening the frequency of noise, dust, and increased human activity associated with the road repair work.

Alternative 3 would alter some scenic elements of the landscape at the two road reroutes (MP 7.0 and MP 7.5) similar to Alternative 2, which would not occur under Alternative 1. Clearing vegetation, introducing views of a paved road, and moving the road farther from the river would change foreground and background views from the road. In terms of views, these changes may be seen as positive or negative depending on the viewer. Overall, Alternative 3 would create short and long-term, minor, adverse impacts to scenic resources.

Recreation: Recreational activities would be temporarily affected by construction activities under Alternative 3. These activities include generating dust, noise, and decreased visual quality. Construction work might also temporarily prevent or impede access to other recreational areas of the Park. Another possible impact on recreation would be from the installation of rock stream barbs. The rock stream barbs would constitute a minor hazard to river rafters by creating an obstruction in the channel. The obstruction would be topped during high flow periods in the spring and early summer, when floating the river is most popular. Later in the summer, however, the structure would protrude above the water surface, although the effects would likely have no greater impact to recreation than other obstacles along the river (Allen 2005). Collectively, impacts under Alternative 3 would be short-term, minor, and adverse. As compared to Alternative 1, Alternative 3 would have less potential to impact recreation because there would be less road repair work over time.

<u>*Cumulative Impacts*</u>

Free Flowing

As stated previously, there are 80 erosion control structures at 35 locations within Segment 1 of the Stehekin River from past projects. Alternative 3 would add 2–4 in-water structures at MP 8.0, which would increase control of the river in this area by 13 percent (refer to the Stream Flow Characteristics section of the EA for additional discussion). Other future projects (likely related to flood events that damage the road) have the potential to involve riverbank stabilization measures that could affect the river’s flow characteristics. These structures would produce long-term changes to the flow characteristics of the river. Thus, Alternative 3, when combined with other past, present, and future projects would have cumulative moderate and long-term adverse impacts on the free-flowing characteristics of the river.

Outstanding Remarkable Values

Wildlife: Wildlife has been or would be affected by other past, present, or future actions. Impacts would be associated with either road repair and construction activities or from the Forest Fuel Reduction Program. These projects may also involve some long-term habitat loss or alteration. As described above, short-term adverse impacts to wildlife are caused by construction, prescribed burning, or manual thinning of trees. These activities generate noise, dust, ash, and increased human activity, which tend to cause avoidance of the area by wildlife. When the impacts of Alternative 3 are combined with all past, present and reasonable future actions, the cumulative effects would be short and long-term moderate, and adverse.

Fish: Cumulative impacts to fish from Alternative 3 would be much the same as those for Alternatives 1 and 2. Fish habitat may be altered by construction of erosion control devices in the river (this may produce beneficial effects, as well as negative effects such as in the case of the creation of pool habitat). Other road repair and prescribed burning can affect fish through short-term reductions in water quality as described above. However, considering Alternative 3 and all other projects, cumulative impacts to fish would be negligible, short-term, and adverse.

Prehistoric and Historic Resources: There would be no cumulative impacts because Alternative 3 would have no impacts to these ORVs, thereby not contributing incrementally to the impacts of other actions.

Geology: Cumulative impacts on geology would occur from disturbance related to excavation and cutting into slopes or from removal of gravel material from the Company Creek gravel pit. Alternative 3 and other past, present, and future projects would likely require disturbing some area of the underlying geologic conditions and removing gravel from the gravel pit. However, yearly removal of gravel from the pit is closely controlled and limited by the Park, thus there is not likely to be a large effect on that resource. Also, there is not much in the way of development or other activities in the project area that would affect the underlying geologic conditions except for improvements to the road. Thus, combining Alternative 3 with other actions would have a cumulative long-term and negligible adverse impact on geology.

Scenic Resources: Combining Alternative 3 with other past present and future actions would result in short and long-term minor adverse cumulative effects. Short-term cumulative minor adverse effects would be caused by activities related to construction road work and prescribed burning and manual thinning of trees. These activities can temporarily reduce the enjoyment of scenic resources by creating noise, dust, smoke and ash, as well as alter views. Longer-term cumulative minor adverse effects are caused by road reroutes, paving the road, and clearing, which more permanently alters views. Similar to what was described under Alternative 2, altered views may be perceived as positive or negative depending on the viewer.

Recreation: The cumulative adverse effects of Alternative 3 and other actions on recreation would generally be short-term and minor. They would be caused by noise, dust, and decreased visual quality from construction or forest fuels reduction activities. There may also be limited access to other parts of the Park due to construction activities and temporary road closures due to flooding, which could affect the recreational resource itself or the ability for people to access the resource. If the road was closed due to flooding for a longer period, then this may become a long-term impact on recreation. Thus, the effects of other past, present and future actions combined with Alternative 3 would cause short and long-term, minor adverse cumulative impacts.

Conclusion

Alternative 3 would have long-term, moderate, adverse impacts on the free-flowing characteristics of the Stehekin River. On the impacts to the river's ORVs, there would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, the impacts can be summarized as follows: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.

Cumulative adverse impacts related to the WSRA would include: long-term and moderate for the Stehekin River's free flowing characteristics; short to long-term and moderate for wildlife; short-term and negligible for fish; long-term and negligible for geology; and short and long-term and minor for scenic resources and recreation. There would be no cumulative impacts on prehistoric or historic resources.

Since there would be no major adverse impact to the Stehekin River's eligibility for listing as a component of the National Wild and Scenic River System or impact on free flowing characteristics or outstandingly remarkable values, there would be no impairment of the park's resources or values.

Alternative 4 – Reroute at MP 7.5

Free Flowing

Under Alternative 4, riverbank modifications would occur at three locations: Wilson Creek (MP 5.3), MP 7.0, and MP 8.0. At Wilson Creek, 400 ft of riverbank would be modified with rock riprap and increase control of the riverbank in this area by 7 percent. At MP 7.0, 4 rock stream barbs would be constructed and increase the percent of controlled riverbank by 18 percent in this area. There would be 2 to 4 rock stream barbs constructed at MP 8.0, which would increase the controlled riverbank in this area by 13 percent. This alternative has the greatest potential to adversely affect the free flowing characteristics of the river as compared to other action alternatives. These changes could affect the free flowing characteristics of the river by altering bank and sediment erosion and channel avulsion processes. Thus, Alternative 4 would have a long-term moderate, adverse impact on the free-flowing characteristic of the Stehekin River. Similar to other action alternatives, Alternative 4 could increase the potential to change the free flowing characteristics of the river as compared to Alternative 1 (see the Stream Flow Characteristics section of the EA for additional discussion).

Under Alternative 4, the road would be rerouted at Wilson Creek and MP 7.5. Relocating the road away from the eroding riverbank would have a beneficial effect, by eliminating the need for additional stream control structures, thus preserving the free flowing condition of the river in these areas.

Outstandingly Remarkable Values

Wildlife: Potential adverse impacts to wildlife from Alternative 4 include short-term construction-related disturbance and long-term habitat loss. Construction would result in increases in noise, dust, and human activity. This would potentially result in disturbance to wildlife, including changes in foraging and nesting behavior and nesting success. Alternative 4 would have a short-term negligible to minor adverse impact on most wildlife (depending on the species – see the Wildlife and Threatened and Endangered Species section of this EA) from construction activities. Compared to Alternative 1, Alternative 4 would have similar impacts on wildlife related to construction and road repair and maintenance.

Construction related disturbances would have a short-term moderate adverse impact on northern spotted owls. However, this alternative would have the least impact of the action alternatives on this species because the road would not be relocated closer to the potential nesting area. Even so, operational impacts related to road use and maintenance would be expected to have a long-term, moderate adverse impact on northern spotted owls.

Implementation of Alternative 4 would result in the long-term loss of approximately 8 acres of upland wildlife habitat. This is somewhat less than the loss of habitat expected under Alternatives 2 and 3. This alternative does involve rehabilitation of 1,700 feet of riverbank, which would improve wildlife habitat quality in these areas, as well as creation of additional pool habitat from installation of rock barbs that would provide additional breeding habitat for frogs and toads. Overall there would be long-term minor adverse impacts from loss of habitat.

Fish: Alternative 4 has the potential to result in the greatest impact on fish as compared to the other alternatives including Alternative 1, because of more in-water and riverbank work and construction of the most erosion control structures in the river. This includes work at MP 5.3, MP 7.0 and MP 7.5. Potential impacts include disturbance of bottom sediments and riverbank materials, increased sediment loading, and decreased water quality. However, the Stehekin River would generally flush any increased sediment fairly quickly, thus adverse impacts on fish would be short-term and negligible. This alternative would also involve rehabilitation of 1,700 feet of streambank, which would have beneficial effects on water quality and therefore fish habitat.

Prehistoric Resources: Generally there would be no impact on prehistoric resources from Alternative 4, because no known prehistoric resources would be affected. An archaeological survey conducted in June 2004 located no prehistoric sites in or near the proposed project area. However, there is some slight potential for an unknown archaeological resource to be present in the project area.

Historic Resources: Historic resources would not be affected by Alternative 4, because there are no historic structures within the proposed project area.

Geology: Similar to other action alternatives, the geology of the area would be affected under Alternative 4. Compared to Alternative 1, there would be slightly more impact on geology. Impacts include a road reroute at MP 7.5, and slope cuts at Wilson Creek (MP 5.3) and MP 6.0 requiring disturbance to the underlying geologic conditions. This would result in long-term, negligible adverse impacts. Similar to Alternatives 2 and 3, material to construct the road would be imported from outside the area and there is only a slight chance that gravel from the Company Creek gravel pit would be used. Alternative 4 would provide a benefit because paving the road would reduce the future need for gravel from the Company Creek gravel pit.

Scenic Resources: Scenic resources would be affected by road construction similar to what would occur under Alternative 1. However, long-term impacts would be reduced as compared to Alternative 1 because the road would be paved reducing the need to maintain the road and lessening the frequency of noise, dust, and increased human activity associated with the road repair work. Alternative 4 would alter some scenic elements of the landscape such as views and vegetation at the road reroute (MP 7.5) similar to Alternative 2, which would not occur under Alternative 1. Clearing vegetation, introducing views of a paved road, and moving the road farther from the river would change foreground and background views from the road (these changes may be seen as positive or negative depending on the viewer). Alternative 4 would create short and long-term, minor, adverse impacts to scenic resources.

Recreation: Impacts on recreation would be much the same as for Alternative 1, except that Alternative 4 would create fewer impacts over time, because there would be less need for periodic roadway repairs. Construction work on Stehekin Valley Road would adversely affect some recreational activities by generating dust, noise, and a decreased visual quality. In addition, construction work might temporarily prevent access to part of the road corridor during the construction period. Another possible impact on recreation would be from the installation of rock stream barbs. The rock stream barbs would constitute a minor hazard to river rafters by creating an obstruction in the channel. The obstruction would be topped during high flow periods in the spring and early summer, when floating the river is most popular. Later in the summer, however, the structure would protrude above the water surface, although the effects would likely have no greater impact to recreation than other obstacles along the river (Allen 2005). Collectively, these impacts would be short-term, minor, and adverse. The long-term beneficial effects of this alternative would be slightly less than under the other action alternatives because more of the road remains near the river, continuing susceptibility to flood damage and related potential access constraints.

Cumulative Impacts

Free Flowing

Within Segment 1 of the Stehekin River there are currently 80 erosion control structures at 35 locations. Alternative 4 would result in the greatest increase in control structures and bank stabilization as compared to other alternatives. Alternative 4 would stabilize the bank at MP 5.3 and add 4 control structures at MP 7.0 and 2–4 control structures at MP 8.0. This would increase control of the river by 7, 18, and 13 percent in the MP 5.3, MP 7.0, and MP 8.0 areas, respectively. Other future projects could also involve riverbank stabilization measures that could affect the river's flow characteristics. These structures would produce long-term changes to the flow characteristics of the river. Thus Alternative 4 combined with other past,

present, and future projects would have cumulative moderate and long-term adverse impacts on the free-flowing characteristics of the river.

Outstanding Remarkable Values

Wildlife: Wildlife species and habitat has been or would be affected by other past, present, or future actions. Road repair, construction, and forest fuels reduction activities have resulted in short and long term disturbance. These activities cause short-term adverse negligible to moderate adverse impacts to wildlife by generating noise, dust, ash, and increased human activity, which tend to cause avoidance of the area by wildlife and may affect nesting or breeding success. There is also loss of habitat area, which is a long-term effect. The cumulative effect of Alternative 4 and all past, present and reasonable future actions would be short and long-term moderate, and adverse.

Fish: The incremental impacts to fish from Alternative 4 would be relatively negligible. Fish habitat may be altered slightly by construction of the erosion control devices in the river and there may be some slight reductions in water quality, however this may also produce beneficial effects such as creation of pool habitat. Other road repair and forest fuel reduction actions can affect fish through short-term reductions in water quality as described previously. However, considering Alternative 4 and all other projects, cumulative impacts to fish would be negligible, short-term, and adverse.

Prehistoric and Historic Resources: There would be no cumulative impacts because Alternative 4 would have no impacts to these ORVs, thereby not contributing incrementally to the impacts of other actions.

Geology: Alternative 4 would add to the cumulative effects on geology by cutting into slopes (there could also be some slight chance that gravel would be removed from the Company Creek gravel pit). Past projects such as construction of the original Stehekin Road required disturbing geologic conditions. Future projects are also likely to require disturbing some underlying geologic conditions, as well as removing gravel from the gravel pit. Since yearly removal of gravel from the pit is closely controlled and limited by the Park, there is not likely to be a large effect on that resource. There is also not much in the way of development or other activities in the project area that would affect the underlying geologic conditions except for improvements to the road. Thus, the cumulative adverse effect of Alternative 4 with other actions would be long-term and negligible.

Scenic Resources: Other past present and future road repair projects, the forest fuel reduction activities, construction of one road reroute, and clearing under Alternative 4 would cause adverse impacts to scenic resources. Short-term minor adverse impacts would be caused by burning, generating noise, ash, and dust, and temporarily increasing human activity. Road reroutes, vegetation clearing and thinning, and paving the Stehekin Valley Road, which would alter views (altered views may be perceived as positive or negative depending on the viewer) and cause long-term minor adverse impacts. Overall, the cumulative adverse impacts of past, present, and reasonably foreseeable future projects, in combination with the impacts of Alternative 4, would be short and long-term, and minor.

Recreation: The cumulative adverse impacts on recreation would be mostly short-term resulting from construction and forest fuel reduction activities. These activities would result in temporary noise, dust, decreased visual quality, and limited access to other parts of the Park. A longer term effect would result if flooding damaged the road to the point that access to other parts of the Park was not possible for an extended period of time. The cumulative effects of other past, present and future actions combined with Alternative 4 would cause short and long-term, minor adverse impacts.

Conclusion

Alternative 4 would have long-term, moderate, adverse impacts on the free-flowing characteristics of the Stehekin River. Regarding the impacts on the river's ORVs, there would be short and long-term, negligible to minor, adverse impacts on wildlife, except for northern spotted owls, which would have long-term moderate adverse impacts. For the other ORVs, the impacts can be summarized as follows: short-term, negligible adverse impacts on fish; no impacts on prehistoric or historic resources; negligible long-term adverse impacts on geologic resources; and short-term adverse and minor impacts on scenic resources and recreation.

Cumulative adverse impacts related to the WSRA would include: long-term and moderate for the Stehekin River's free flowing characteristics; short to long-term and moderate for wildlife; short-term and negligible for fish; long-term and negligible for geology; and short and long-term and minor for scenic resources and recreation. There would be no cumulative impacts on prehistoric or historic resources.

Since there would be no major adverse impact to the Stehekin River's eligibility for listing as a component of the National Wild and Scenic River System or impact on free flowing characteristics or outstandingly remarkable values, there would be no impairment of the park's resources or values.

FLOODPLAINS

This section describes the characteristics of the Stehekin River floodplain. Information for this section came from a Statement of Findings for Floodplain Management (Appendix A), as well as additional data and mapping information from various NPS staff.

Affected Environment

The Stehekin Valley in the vicinity of the road project is relatively flat in comparison to the near vertical valley walls. The valley floor between the Harlequin Bridge and northern terminus of the road project is comprised of high terraces, low terraces, glacial moraines, flood channels, and the floodplain of the Stehekin River (Riedel 2003, 2004a). The floodplain and flood channels make up the majority of the valley and the Stehekin Valley Road traverses the 100-year floodplain in several places (MP 7.0, MP 8.0, and McGregor Meadows), as well as the 500-year floodplain.

As described above under the stream flow section, it is a natural occurrence for the river to produce flows that cannot be contained within its stream channel. During these flood events, the river jumps out of its channel and flows through the floodplain. This was evidenced during the recent floods in October of 2003. Large flood flows, sediment movement, and the presence of semi-stable large wood debris make the channel and floodplain dynamic and ever-changing. As described in the GMP/EIS, the floodplain performs several important functions including: (1) Conveying and storing floodwater, (2) Storing river sediment, and (3) Supporting a variety of vegetation that provides food and habitat to a rich diversity of wildlife species.

The locations in the valley available for development are limited due to the steep valley walls and relatively small valley area. Therefore, development has occurred within the 100-year floodplain and the natural river processes of erosion, channel forming, and meandering of the river threatens private property, some park facilities, and roads. Hazards to this development are the relatively rapid bank erosion, sediment deposition, periodic channel shifts and swift water velocities. Riedel (2004a) estimates that flood depths during a 100-year storm event would range on the order of 2 to 3 ft in depth at McGregor Meadows, while velocities in McGregor Meadows would range from 8 to 9 cfs, and velocities along the Stehekin Valley Road would be 3 to 4 cfs. These velocities are enough to erode the roadbed and

road surface. Even during flood events as small as the 10-year return interval, the road would be temporarily impassible. Due to the recent changes in the floodplain and river channel process, floods occur more frequently at lower discharges at McGregor Meadows (Riedel 2004a).

One of the risks of this situation is that floods may create safety concerns for people using the Stehekin Valley Road. Currently, it may take several hours to half a day to warn residents and tourist about possible road flooding. Howe

ver, floodwaters are generally anticipated to rise fairly slowly and high ground is available in many areas within a short distance of the Stehekin Valley Road (generally within 1/2 mile). In addition, the National Weather Service is considering the implementation of a flood warning system for the valley (although this is not a high priority for the National Weather Service).

Environmental Consequences

Methodology

The impact analysis for floodplains were conducted based on site visits, analysis of GIS data layers showing the floodplain and side channels of the Stehekin River, a Statement of Findings for the Stehekin Floodplain prepared by NPS staff (Riedel 2004a), personal observations by NPS staff, and professional judgment. The intensity definitions for floodplains are listed below.

Effect Intensity	Effect Description
Negligible	There would be no change in the ability of a floodplain to convey floodwaters, or its values and functions. The alternative would not contribute to flooding.
Minor	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local, although the changes would be only just be measurable. The alternative would not contribute to flooding. No mitigation would be needed.
Moderate	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local. The alternative could contribute to flooding. The impact could be mitigated by modification of proposed facilities in floodplains.
Major	There would be changes in the ability of a floodplain to convey floodwaters, or impacts to its values and functions, would be measurable and widespread. The alternative would contribute to flooding. Mitigation measures would be extensive and their success could not be assured.
Other Qualifiers	**Description**
Beneficial Effect	The alternative would improve floodplain functions compared to the existing condition.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to floodplains be achieved in the park.

Desired Condition	Source
Evaluate impacts to floodplains, reduce the potential risk involved in placing facilities within floodplains, and protect floodplain values.	Executive Order 11988
Map locations of 100-year and 500-year floodplains. Preserve floodplain values and minimize potentially hazardous conditions associated with flooding.	NPS Floodplain Management Guideline

Impacts of the Alternatives

Alternative 1 - No-Action

Under the No Action Alternative, the road would generally not be changed. However, it is likely given the fact that several areas of the road (MP 7.0, MP 8.0, and McGregor Meadows) are located in the floodplain and vulnerable to flood damage that emergency roadwork including road reroutes, construction of erosion structures in the Stehekin River, or placement of fill in the floodplain may be necessary. These emergency measures would impact the floodplain: by restricting the movement of the river (e.g., constructing erosion/flood controls such as stream barbs); by placing fill in the floodplain, which can reduce flood storage capacity; and by road reroutes, which can change the way floodwaters flow through the floodplain. Even though these measures would affect the floodplain, they generally would not contribute to flooding. Thus, these types of actions would constitute long-term, minor adverse impacts on the floodplain.

<u>Cumulative Impacts</u>

Other past projects have resulted in actions that affected the ability of the floodplain to convey or store floodwater. For example, the original construction of the 23-mile Stehekin Valley Road has had an effect on the capacity of the floodplain because of road fill placed in the floodplain, as well as affecting how floodwaters flowed across the floodplain in certain areas, including the lower river near the head of Lake Chelan, at Harlequin Bridge, and McGregor Meadows. Fill placed in a floodplain generally decreases the storage capacity of the floodplain. The road also blocks flood flows in some areas and serves as a conduit for flood flows in other areas. Thus, past projects have had some affect on the floodplain. Generally, under Alternative 1 there would be little or no fill placed in the floodplain and the road alignment would not be appreciably changed, except under emergency conditions. However, it is likely that emergency measures would be needed in the future, as flooding has continued to impact the road. Other future projects could include some adverse and beneficial effects on floodplains. Adverse impacts would occur where fill was placed in the floodplain. However, other projects such as a road reroute at Coons Run would benefit the floodplain by moving the road out of the floodplain or moving it farther away from the river. This would increase the floodplain capacity for smaller storm events.

Combining past, present, and future projects, the cumulative effect on the floodplain has been and would be relatively minor because of the large area of the floodplain in relation to the area potentially affected by the combined projects. In addition, road improvements are designed to reduce impacts to the floodplain and generally do not contribute to flooding. Therefore, the cumulative impacts would be long-term, adverse, and minor in effect.

<u>Conclusion</u>

Alternative 1 would have long-term, minor adverse impacts because emergency road repairs are likely to be required in areas where the Stehekin Valley Road is located in the floodplain (i.e., MP 7.0, MP 8.0, and McGregor Meadows), and these repairs may impact the flood storage capacity of the floodplain, as well as how floodwaters move across the floodplain. Cumulative impacts would also be long-term, minor and adverse in effect, because there has been and will likely continue to be a need to place fill in the floodplain for road maintenance, as well as keeping the road located in the floodplain (largely because there are several areas where the floodplain extends almost to the valley walls). Projects that move the road completely out of the floodplain would provide a beneficial effect on floodplains, because there would be a reduced effect on flood flows and an increase in flood storage capacity (if the road prism were removed from the floodplain). Since there would be no major adverse impacts to floodplains there would be no impairment of park resources or values.

Alternative 2 - Preferred Alternative

Rerouting the road alignment in several places (MP 7.0 and MP 7.5) would move the road farther from the Stehekin River. This would provide a benefit by slightly increasing the flood storage capacity of the floodplain nearer to the river, reducing the potential for erosion of the road, allowing the river slightly more room to meander in these areas, and reducing the potential to restrict or channel flood flows. Road reroutes would generally not occur under Alternative 1 (except in emergency situations), thus Alternative 2 would improve conditions in the floodplain as compared to Alternative 1.

The road would remain within either the 100-year or 500-year floodplain in several places, such as MP 7.0, MP 8.0, and McGregor Meadows. There would be minor long-term adverse impacts from placing additional fill in the floodplain, which would slightly reduce the storage capacity of the floodplain. However, this would be more than offset by moving the Stehekin Valley Road farther away from the river. Alternative 2 would have long-term minor adverse impacts on floodplains, because there would be some measurable changes in the ability of the floodplain to convey and store floodwaters on a localized level, but the road improvements would not contribute to flooding.

Cumulative Impacts

Alternative 2 would result in long-term minor adverse impacts on the floodplain. Other past, present and future actions have or are likely to result in adverse impacts on the floodplain. Past actions included construction of the Stehekin Valley Road and the placement of fill in the floodplain, channelization of the Stehekin River, and construction that changed the movement of flood flows across the floodplain (such as the Stehekin Valley Road). Present and future actions such as improvements to the Stehekin Valley Road in the project area under Alternative 2 and other projects between MP 9.15 and the end of the road are also likely to contribute to changes to the floodplain (from fill) or changes in how floodwaters move across the floodplain. They may also provide benefits by moving the road out of the active floodplain such as the Coon Run project. Alternative 2 would contribute to the amount of fill in the floodplain, but the area of cumulative fill for all projects including Alternative 2 would be minor in comparison with the total floodplain area. Thus, adverse cumulative impacts would be minor and long-term. In addition, there would also be some benefits gained by moving the road farther away from the river as described above.

Conclusion

Alternative 2 would result in long-term, minor adverse impacts to the floodplain. The cumulative effects would also be long-term and minor in effect, because placing additional fill within the floodplain would cause measurable and localized effects in the floodplain, but would generally not contribute to flooding. There would also be some long-term benefits by moving the road farther from the river, thus slightly increasing flood capacity near the river for more frequent and smaller flood events. Because there would be no major adverse impacts to floodplains there would be no impairment of park resources or values.

Alternative 3 – Minor Improvements

Under Alternative 3, there would be two road reroutes (at MP 7.0 and MP 7.5) that would move the road farther from the Stehekin River (although not as far as under Alternative 2). This would provide a benefit by slightly increasing the flood storage capacity near the river and reducing the potential for the road to affect flood flows. Compared to Alternative 1, Alternative 3 would improve conditions in the floodplain because under Alternative 1 the road would not be rerouted except under emergency conditions.

Alternative 3 would result in some localized changes to the floodplain that would be measurable. These changes would be caused by placing fill in the floodplain (at MP 7.0, MP 8.0 and McGregor Meadows) thus slightly reducing the flood storage capacity of the floodplain and by moving the Stehekin Valley Road farther away from the river, which could change the way floodwater moves across the floodplain.

These changes would be relatively permanent and would be measurable. However, it is not anticipated that Alternative 3 would contribute to flooding. Thus, the potential adverse impacts of Alternative 3 would be long-term and minor.

Cumulative Impacts

Alternative 3 would have long-term, minor adverse impacts on floodplains. The other past, present, and future actions would also have minor long-term adverse impacts on floodplains, because there has been or would be fill placed in the floodplain. There would be some measurable effects on flood storage and conveyance, but none of the projects would appreciably contribute to flooding. Future projects such as Coon Run or other projects that include road reroutes would provide a benefit by moving the road farther away from the river and increasing the flood storage capacity in the floodplain near the river. Alternative 3 would incrementally increase the amount of fill placed in the floodplain, however this would be a negligible increase when compared to the total floodplain in the project area. Thus, cumulative adverse impacts would remain long-term and minor.

Conclusion

Alternative 3 would result in long-term minor adverse impacts, because fill would be placed in the floodplain slightly reducing the storage capacity of the floodplain in a localized area. However, this alternative would also provide benefits by moving the road farther away from the river. Adverse cumulative impacts would also be long-term and minor in effect, because of past, present, and ongoing projects that result in fill placement in the floodplain. Since, there would be no major adverse impacts to floodplains; there would be no impairment of park resources or values.

Alternative 4 – Reroute at MP 7.5

Alternative 4 is similar to Alternatives 2 and 3 in that it would result in the placement of fill in the floodplain in several areas including MP 8.0 and McGregor Meadows. It would not place fill in the other section where the road runs through floodplain at MP 7.0. Instead, there would be 4 rock stream barbs constructed in the river to control erosion. Similar, to Alternatives 2 and 3, the road reroute at MP 7.5 would provide a beneficial effect by slightly increasing flood storage capacity near the Stehekin River for smaller storm events. The impacts to floodplains from fill would likely be measurable and localized, but would not contribute to flooding, thus adverse impacts would be minor. Fill placement would be permanent therefore impacts would be long-term.

Compared to Alternative 1, Alternative 4 provides more benefits to floodplains, because more of the road would be moved away from the river, thus slightly increasing flood storage over Alternative 1.

Cumulative Impacts

Alternative 4 would have long-term adverse minor impacts on floodplains from fill placement that could change the flow of floodwaters. It also provides some beneficial effects because the road reroute would move the road farther from the river. Minor long-term adverse impacts to floodplains would occur because of the past, present, and future activities that have or will place fill in the floodplain. Combining other projects with Alternative 4 would produce changes in the floodplain that were measurable, however these are localized and generally do not contribute to flooding. Therefore, cumulative adverse impacts would be long-term and minor.

Conclusion

This alternative would have long-term minor adverse impacts because of placing fill in the floodplain (at MP 7.0, MP 8.0, and McGregor Meadows). Similarly, cumulative adverse impacts would be long-term and minor. This alternative also provides some benefit by moving the road farther from the river near MP 7.5, thus slightly increasing flood storage capacity near the Stehekin River in this location. There would

be no impairment of park resources or values, because there would be no major adverse impacts to floodplains.

VEGETATION

This section describes the vegetation that exists in the Stehekin Valley and the potential effect of the proposed action and the alternatives on these resources. Various planning level and environmental documents, National Wetland Inventory maps, aerial photos, field visits, GIS data, plant surveys, and personal communications with NPS staff were used to identify various plant communities located within the project area. A detailed study of the vegetation communities present within the Stehekin Valley that was conducted for the Lake Chelan NRA General Management Plan EIS (1995) was also used.

Affected Environment

According to the vegetation study conducted for the Lake Chelan GMP EIS, 36 different land cover types were identified in the valley. The cover types were broken down into five major categories, based upon soil moisture, and then further broken down by species composition. The five main categories are: (1) Riparian Nutrient-Poor, (2) Riparian Nutrient-Rich, (3) Upland Mesic (moderate moisture), (4) Upland Xeric (dry), and (5) miscellaneous.

Plant species found in the first cover type (riparian nutrient-poor); include red alder (*Alnus rubra*), Sitka willow (*Salix sitchensis*), black cottonwood (*Populus balsamifera*), and red alder/black cottonwood associations. Communities and individual species represented in the second cover type (riparian nutrient-rich) include: mixed deciduous, mixed coniferous, mixed deciduous/coniferous, grand fir (*Abies grandis*), western redcedar (*Thuja plicata*), Douglas fir, big leaf maple (*Acer macrophyllum*), black cottonwood, black cottonwood/alder, alder, aspen (*Populus* sp.), Scouler's willow (*Salix scouleriana*), and emergent vegetation (primarily sedge dominated stands).

The third cover type is upland mesic and is a non-riparian community. This type includes mixed deciduous, mixed coniferous, mixed deciduous/coniferous, grand fir, Douglas fir, Ponderosa pine (*Pinus ponderosa*), big leaf maple, and black cottonwood. The fourth cover type is upland xeric and is primarily found on the driest sites, which are located on the valley's steeper slopes. This cover type is comprised of the xeric uplands, active erosion/talus, and slope or talus drainage areas and supports sparse herbaceous plants, some trees, and lichens. The final class is composed of miscellaneous cover types including the following types: sand/gravel/cobble, water, lawn/pasture, orchard/large garden, development, disturbed areas, and roads. Vegetation is absent from developed areas and roads. In the other areas, vegetation types include maintained lawns with ornamental trees and shrubs, fruit trees, and pasture grasses or hay and alfalfa.

The three most common vegetation cover subtypes in the valley are: (1) mixed coniferous, (2) riparian mixed deciduous/coniferous, and (3) Douglas fir. The mixed coniferous cover type is predominantly made up of Douglas fir (*Pseudotsuga menziesii*), but this community also contains ponderosa pine (*Pinus ponderosa*) or grand fir (*Abies grandis*). The riparian mixed deciduous/coniferous cover type includes red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), big leaf maple (*Acer macrophylum*), Douglas fir, grand fir, ponderosa pine, and western redcedar (*Thuja plicata*). Finally, the Douglas fir cover type includes primarily pure stands of Douglas fir.

Common understory species present within these communities are shown in Table 5. Some of these include the Western dogwood, service berry, oceanspray, manzanita, Watson's willow-herb, pine grass, lemon's needle grass, and sword fern.

Table 5. Common Understory Plant Species in the Stehekin Valley

Scientific Name	Common Name
Understory Trees	
Cornus nuttallii	Western dogwood
Shrubs and Vines	
Amelanchier alnifolia	service berry
Apocynum ansrosaemifolium	dogbane
Arctostaphylos nevadadesis	manzanita
Berberis aquifolium	mahonia
Ceonothus velutinus	Snow bush
Holodiscus discolor	ocean spray
Shrubs and Vines (continued)	
Paxistima myrsinites	boxwood
Symphoricarpos albus	snowberry
Forbs	
Arenaria macrophylla	Big leaf sandwort
Epilobium watsonii	Watson's willow-herb
Grasses	
Calamagrostis rubescens	pine grass
Carex rossii	ross's sedge
Festuca occidentalis	Western fescue
Melica subulata	Onion grass
Stipa lemmonii	lemon's needle grass
Ferns and Fern Allies	
Polystichum munitum	Sword fern

Logging, wildfire suppression, farming, and other human activities have changed the vegetation composition within the Stehekin Valley. Some notable areas include McGregor Meadows (MP 6.5 – MP 7.0) and the Stehekin Valley Ranch (MP 9.0) where historic farm and ranch activities have altered vegetation, which has not recovered to native plant communities (Reidel 2004b).

NPS conducts wildfire suppression activities through its forest fuel reduction program. Within the project area fire suppression measures include prescribed natural fire, management-ignited prescribed fire, and selective manual fuel reductions to improve fire protection for human life and property. Additionally, NPS manages the forested areas to develop a late-succession stage ponderosa pine and Douglas fir forest (NPS 1995b).

Exotic and Noxious Plants

Exotic plants are those species that have been relatively recently introduced to the region. Exotics, which may be invasive or non-invasive, often compete with native plant species**.** Noxious weeds (invasive exotics) are of greater concern and are recognized as plants that have the undesirable traits of excluding native plants, spreading rapidly, and that are difficult to eradicate or control. Exotic and noxious weed species within the project area are generally limited to road corridors and private development sites.

Roads provide habitat characteristics that are favorable to many exotics and noxious weeds, such as poor droughty soils, exposed mineral soil, and open canopy conditions. In addition, roads are corridors by which people unknowingly transport and spread seeds of exotic and noxious weed species via automobiles. Common non-native exotic plant species that may be found within the project area are: diffuse knapweed, Dalmatian toadflax, rush skeletonweed, common mullein, Canada thistle, Japanese knotweed, Scot's broom, baby's breath, oxeye daisy, Himalayan blackberry, tansy, and foxglove (NPS 1995a). NPS staff annually monitors the project area for non-native invasive plants. In the recent past, NPS staff has only found diffuse knapweed along the project corridor. There does not appear to be an established population and park staff pulls one to several plants a year in various locations.

Environmental Consequences

Methodology

The analysis of impacts on vegetation was based on the amount of disturbance (removal or damage to vegetation) from construction or road operations compared to current conditions. The analysis also included an assessment of the potential for the project to introduce or spread non-native plant species such as exotics and noxious weeds.

Effect Intensity	Effect Description
Negligible	No native vegetation would be affected or some individual native plants could be affected, but there would be no effect on native species populations. No or barely detectable increases in the number of non-native species and extent of their range. The effects would be short-term, on a small scale, and so small as to not be measurable.
Minor	The alternative would affect some individual plants and would also affect a relatively minor segment of that species' population. Mitigation to offset adverse effects could be required and would be effective. Changes in the extent of non-native species would be short-term, localized and measurable to one or more species. Mitigation of effects would be simple and effective.
Moderate	The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. Changes in the extent of several or more non-native species would be over a relatively long period of term. Non-native plants would spread beyond the localized area. Mitigation to offset adverse effects could be extensive, but would likely be successful, depending on the species of non-native plants involved.
Major	The alternative would have a considerable long-term effect on native plant populations and non-native plants, and would affect over half of the project area for an extended period of time. Mitigation measures to offset the adverse effects would be extensive, and success of the mitigation measures would not be assured.
Other Qualifiers	**Description**
Beneficial Effect	The alternative would enhance native vegetation.
Duration of Effect	Short-term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to vegetation be achieved in the park:

Desired Condition	Source
NPS is directed by the Organic Act to conserve the scenery and the natural objects in an unimpaired state for future generations. The general principles for managing biological resources are defined in the Management Policies and state that all components and processes of naturally evolving park ecosystems including the natural abundance, diversity, and ecological integrity of plant communities be maintained.	NPS Organic Act

Desired Condition	Source
When NPS management actions cause native vegetation to be removed, then the NPS will seed to ensure that such removals will not cause unacceptable impacts to native resources, natural processes, or other park resources.	NPS Management Policies
Exotic and noxious weeds (non-native species) are not a natural element of the park ecosystem. Management of populations of non-native plant species up to and including eradication will be undertaken wherever such species threaten park resources or public health when control is prudent and feasible.	DO-77, Natural Resource Protection; Executive Order 13112 - Invasive Species

Impacts of the Alternatives

Alternative 1 - No-Action

Implementation of Alternative 1 would affect vegetation communities in the project vicinity from continued placement of gravel on the roadway and could impact vegetation if there is a need to repair the road because of future flood damage. The seasonal placement of gravel along the roadbed could remove vegetation or disturb colonizing roadside vegetation along the edges of the roadway. This may have more effect on non-native species than native plant species because non-natives tend to colonize along road edges. Use of gravel for maintenance activities has greater potential to increase populations of non-native invasive plant species, because seeds from these species are typically located in the gravel. Seeds from these non-native invasive plants may then be spread and germinate in places where the gravel is used. The adverse effects on vegetation from road maintenance would be minor and short-term.

Vegetation may also be disturbed if road sections are damaged by flooding and there is a need to construct an emergency reroute of the road. In this instance, it would be necessary to clear larger areas of vegetation including trees, shrubs, and grasses. These areas would be covered over in gravel and thus there would be a long-term loss of vegetation in these areas (for some of these emergency situations there may be potential to rehabilitate abandoned road sections and replace some of the lost vegetation). This adverse effect on vegetation would be long-term and minor.

Cumulative Impacts

Other road related projects have contributed to the loss of vegetation in the project area. The original 23-mile road development disturbed approximately 50 acres of vegetation and the area that the road occupies has displaced vegetation. Past and future road reroutes, emergency road improvements, and ongoing maintenance of the road contribute to either temporary or permanent loss of vegetation (some of the projects have also involved rehabilitating road sections by returning these sections to their natural vegetative state). The Forest Fuels Reduction Program has impacted vegetation in the vicinity of the road by removing vegetation and altering the types of vegetation that may occur in any particular area. Other projects have also increased the potential to spread non-native invasive plant species, however, NPS staff monitors for the presence of these species and has an active removal program. Thus, non-native plant species are fairly well controlled. There would likely be an incremental increase in the loss of vegetation by adding Alternative 1 to other past, present, and future actions. However, it is not anticipated that more than a relatively minor segment of any particularly plant species would be affected. Thus, the cumulative adverse impacts on vegetation would be long-term and minor.

Conclusion

Alternative 1 would result in both short-term and long-term adverse minor impacts on vegetation because of the need to spread gravel to maintain the road, which encroaches on plant species along the road edge, and potentially from the need to clear vegetation to repair flood damaged road sections. Since there would be no major impact on vegetation, there would be no impairment of park resources or values.

Alternative 2 – Preferred Alternative

Approximately 10 acres of land and vegetation disturbance would occur under this alternative. This includes removing deciduous, mixed deciduous, conifer, and to a lesser extent plant species located on talus slopes and sparsely vegetated communities. Approximately 3 acres of overstory vegetation broadly categorized into 7 habitat types would be lost at the two road reroute areas (MP 7.0 and MP 7.5) (Kuntz and Glesne 1993). These include Bigleaf maple, cottonwood, deciduous/coniferous mix, Douglas fir, mixed coniferous, mixed deciduous, and sand/gravel/cobble. In the context of the Stehekin Valley the amounts lost would be considered minor (the loss is less than 1 percent for each habitat type). However, two of the classes, Bigleaf maple and cottonwood (there would be a loss of 1.25 acres of Bigleaf maple and 0.12 acres of cottonwood at the road reroutes), have high ecological value for wildlife and any loss of these habitat types is a concern.

Much of the 10 acres of affected vegetation, particularly in the areas of the road reroutes, pullouts, and turnaround area would be lost as the paved road would permanently (for the foreseeable future) cover the ground surface. This clearing would generally not occur under the No Action Alternative except in emergency situations (as described above). Impacts associated with the removal of 10 acres of vegetation would include soil compaction and an increase in the potential to spread invasive non-native plant species. At the two road reroutes, cutting new roadways into existing blocks of native plants could increase the spread of exotic plant species into forest interior habitat. Also, in existing shady areas, removing vegetation could increase the amount of direct sunlight and therefore encourage the spread of native and non-native sun-tolerant plant species, which could shift local plant composition from one of shade-tolerant to sun-tolerant plant species. Removal of plant cover outside the road prism would temporarily reduce plant cover and increase the potential for erosion and sedimentation (see Water Quality section). Exotic and noxious weeds may also be inadvertently imported with the construction materials such as structural fill and spreading this fill could increase the populations of existing and noxious weeds. There would also be temporary removal of plants at the periphery of the construction area, soil compaction, and inadvertent removal of plant species during construction. These impacts would cause short and long-term minor adverse effects on vegetation.

Beneficial impacts to vegetation communities would result from obliterating and revegetating the abandoned road segments (approximately 1.8 acres) and returning them to their natural state. Native vegetation would be used to revegetate these areas. In the areas of in-water or riverbank work (MP 5.3 and MP 8.0) the riverbank would be rehabilitated and replanted with native vegetation.

Mitigation measures for minimizing vegetation disturbance and replacing lost vegetation include:

- Obliterate and revegetate abandoned road segments and areas disturbed by construction with native plant species.
- Use bioengineering techniques such as willow layering to stabilize slopes.
- Minimize the area to be cleared.

Mitigation measures for preventing the spread of noxious weeds include:

- Only freshly exposed subsurface materials would be imported from the quarry outside the park. No stockpiled materials from the quarry would be used.
- Material removed from the offsite quarry would be covered while being transported into the Lake Chelan NRA.
- All vehicles having contact with soil or materials that may contain noxious weed seed would be washed prior to working in weed free areas or transporting weed free materials.

- Any soil or rock materials that would be stored would be covered to prevent exposure to noxious weed seed.
- Salvaged soil known to contain noxious weeds would be stored, covered, and separated form weed free soil. This material could be used for subsurface fill.

Cumulative Impacts

Similar to the discussion under Alternative 1, other road and non-road related projects have contributed to the loss of vegetation in the project area, including disturbance of approximately 50 acres of vegetation during the construction of the original 23-miles of road. Projects such as emergency road reroutes, ongoing road maintenance, and the Forest Fuels Reduction Program have eliminated, disturbed, or altered vegetation in the vicinity of the road. These projects have also increased the presence of non-native invasive plants; however, park staff has kept these species largely under control. Alternative 2 would result in an incremental increase in the loss of vegetation. However, similar to Alternative 1, it is not anticipated that more than a relatively minor amount of vegetation species would be lost in comparison to the total vegetation area in the Stehekin Valley (however, note that loss of Bigleaf maple and cottonwood is a concern because of the high value of this habitat type for wildlife). Thus, the cumulative adverse impacts on vegetation would be long-term and minor.

Conclusion

Alternative 2 would result in short and long-term minor adverse effects on vegetation. This alternative would also provide some long-term benefits to vegetation by rehabilitating the abandoned road sections (MP 7.0 and MP 7.5) and several sections of streambank (MP 5.3 and MP 8.0) with native vegetation. Cumulative adverse effects on vegetation would be long-term and minor. Since there would be no major impacts to vegetation, there would be no impairment of park resources or values.

Alternative 3 – Minor Improvements

Alternative 3 would have similar types of impacts as Alternative 2 (i.e., soil compaction, loss of vegetation and high value overstory wildlife habitat, potential increase in noxious weeds, and changing location patterns of sun tolerant and shade tolerant plants), but the intensity of the adverse effects would be somewhat lessened because there would be slightly less land disturbance under this alternative. Approximately 9 acres of land would be cleared as compared to 10 acres for Alternative 2. This is mostly due to the road reroute at MP 7.5, which would be 1,000 feet in length as compared to 2,300 feet for Alternative 2. There would also be no land disturbance and loss of vegetation at Wilson Creek or MP 6.0, since no work is planned in these locations. The 9 acres of disturbed vegetation that would occur under this alternative generally wouldn't occur for Alternative 1. The exception for Alternative 1 would be for emergency situations requiring road repairs or road reroutes in response to flood damage. Thus, Alternative 3 is likely to result in increased levels of vegetation disturbance as compared to Alternative 1. Alternative 3 would also provide benefits to vegetation from rehabilitating abandoned road sections (MP 7.0 and MP 7.5) and riverbank (MP 8.0). Although compared to Alternative 2, slightly less riverbank would be rehabilitated. The impacts to vegetation for Alternative 3 would be short and long-term, minor adverse impacts. Mitigation measures would be similar to Alternative 2.

Cumulative Impacts

Vegetation has been adversely affected by past actions such as the original construction of the road, emergency road reroutes, ongoing road maintenance, and the Forest Fuels Reduction Program. These effects have included loss of vegetation, spread of non-native plant species, soil compaction, and alteration of the vegetation types in specific areas. Some of these projects have also provided benefits by rehabilitating riverbank sections or abandoned road segments with native vegetation. Future and ongoing

projects would have similar types of impacts on vegetation. Combining Alternative 3 with other past, present, and future projects would result in long-term minor adverse impacts on vegetation similar to what was described under Alternative 2.

Conclusion

Alternative 3 would result in short and long-term minor adverse effects on vegetation. This alternative would also provide some long-term benefits to vegetation by rehabilitating the abandoned road sections in the road reroute areas (MP 7.0 and MP 7.5) and the riverbank at MP 8.0 with native vegetation. Cumulative adverse effects on vegetation would be long-term and minor. Since there would be no major impacts to vegetation, there would be no impairment of park resources or values.

Alternative 4 – Reroute at MP 7.5

Alternative 4 would result in the disturbance to 8 acres of vegetation. Compared to Alternatives 2 and 3, this alternative would have the least amount of vegetation disturbance. However, Alternative 4 would disturb 8 acres of vegetation that generally would not occur under Alternative 1, except in the event of flood damage that may require a future emergency road reroute. The types of impacts to vegetation under this alternative would be similar to Alternatives 2 and 3. These include soil compaction, loss of vegetation and high value overstory wildlife habitat, potential increase in noxious weeds, and changing location patterns of sun tolerant and shade tolerant plants. Similar to the other action alternatives, there would also be beneficial effects on vegetation from revegetating the riverbank with native vegetation at two locations (MP 7.0 and MP 8.0) and rehabilitating the abandoned road section at MP 7.5. Thus, adverse impacts on vegetation would be short and long-term and minor in effect. Mitigation measures would be similar to Alternative 2.

Cumulative Impacts

The adverse effects of past, present, and future actions have included or would include soil compaction, loss of vegetation, spread of non-native plant species, and alteration of vegetation types along the road corridor similar to what was described above for the other alternatives. Some of these projects have also provided benefits by rehabilitating riverbank sections or abandoned road segments with native vegetation. Combining Alternative 4 with other past, present, and future projects would result in long-term minor adverse impacts on vegetation.

Conclusion

Alternative 4 would result in short and long-term minor adverse effects on vegetation. This alternative would also provide some long-term benefits to vegetation by rehabilitating the abandoned road section at the MP 7.5 road reroute. There would also be benefits to vegetation from revegetating the riverbank with native vegetation at the MP 5.3, MP 7.0, and MP 8.0 locations. Cumulative adverse effects on vegetation would be long-term and minor. Since there would be no major impacts to vegetation, there would be no impairment of park resources or values.

WILDLIFE AND THREATENED AND ENDANGERED SPECIES

This section describes the common wildlife and threatened and endangered species in the project area. It also analyzes and assesses the potential impact of the project on those species.

Affected Environment

Common Wildlife Species

NPS staff has documented 40 species of mammals, 96 species of birds, 2 species of lizard, 5 species of snakes, 5 species of amphibians, and several fish species in the Stehekin Valley over the past 20 years (Kuntz and Glesne 1993 and Duke Engineering and Services 2000). Some of these species include mammals such as black bear (*Ursus americanus*), Columbia black-tailed deer (*Odocoileus hemionus columbianus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and snowshoe hare (*Lepus americanus*). Some of the bird species include the gray jay (*Perisoreus canadensis*), dark-eyed junco (*Junco hyemalis*), black-capped chickadee (*Poecile atricapilla*), blue grouse (*Dendragapus obscurus*), common raven (*Corvus corvus*), red-tailed hawk (*Buteo jamaicensis*), and American kestrel (*Falco sparverius*). Amphibians, lizards, and snakes include the northwestern salamander (*Ambystoma gracile*), rough-skinned newt (*Taricha ganulose*), northern alligator lizard (*Gerhonotus coeruleus*), common garter snake (*Thamnophis sirtalis*), and western terrestrial garter snake (*Thamnophis elegans*). Fish species include introduced rainbow trout (*Oncoryhnchus mykiss*), brook trout (*Salvelinus fontinalis*), and kokanee (*Oncoryhnchus nerka*).

Threatened and Endangered Species

This section focuses on species listed as threatened or endangered or proposed for listing by either the USFWS or the Washington Department of Fish and Wildlife (WDFW). Table 6 lists federal and state threatened and endangered species and species of concern that are known to occur or may occur in the project area. Not all of these are discussed in detail because some of these species are not likely to be affected by the project. These include the fisher, wolverine, American peregrine falcon, yellow-billed cuckoo, little willow flycatcher, golden eagle, merlin, flammulated owl, Lewis' woodpecker, black-backed woodpecker, and tailed frog. These species are discussed in a separate section below.

Table 6. Federal and Washington State Listed Wildlife Species and Federal Species of Concern That Are Known To or May Occur in the Stehekin Valley Vicinity

Species		Status	
Common Name	**Scientific Name**	**Federal**	**State**
Mammals			
Gray wolf	*Canus lupus*	T	E
Grizzly bear	*Ursus arctos*	T	E
Canada lynx	*Lynx canadensis*	T	T
Fisher	*Martes pennanti*	SC	E
Wolverine	*Gulo gulo*	SC	C
Western gray squirrel	*Sciurus griseus griseus*	SC	T
Long-eared myotis	*Myotis evotis*	SC	
Fringed myotis	*Myotis thysanodes*	SC	
Long-legged myotis	*Myotis volans*	SC	
Yuma myotis	*Myotis yumanensis*	SC	
Townsend's big-eared bat	*Corynorhinus townsendii*	SC	C

Table 6. Federal and Washington State Listed Wildlife Species and Federal Species of Concern That Are Known To or May Occur in the Stehekin Valley Vicinity (continued)

Species		Status	
Common Name	**Scientific Name**	**Federal**	**State**
Birds			
Bald eagle	*Haliaeetus leucocephalus*	T	T
Northern spotted owl	*Strix occidentalis caurina*	T	E
Harlequin duck	*Histrionicus histrionicus*	SC	
Northern goshawk	*Accipiter gentiles*	SC	C
American peregrine falcon	*Falco peregrinus anatum*	SC	S
Yellow-billed cuckoo	*Coccyzus americanus*	C	C
Olive-sided flycatcher	*Contopus borealis*	SC	
Little willow flycatcher	*Empidonax traillii brewsteri*	SC	
Golden eagle	*Aquila chrysaetos*		C
Birds (continued)			
Merlin	*Falco columbarius*		C
Flammulated owl	*Otus flammeolus*		C
Vaux's swift	*Chaetura vauxi*		C
Lewis' woodpecker	*Melanerpes lewis*		C
Black-backed woodpecker	*Picoides albolarvatus*		C
Pileated woodpecker	*Dryocopus pileatus*		C
Amphibians			
Tailed frog	*Ascaphus truei*	SC	
Western toad	*Bufo boreas*	SC	C
Cascades frog	*Rana cascadae*	SC	
Columbia spotted frog	*Rana luteiventris*	SC	C
Fish			
Bull Trout	*Salvelinus confluentus*	T	
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	SC	

T = Threatened Species SC = Species of Concern
E = Endangered Species C = Candidate

This section describes the following wildlife and fish species: gray wolf, grizzly bear, Canada lynx, western gray squirrel, bats, bald eagle, northern spotted owl, harlequin duck, northern goshawk, olive-sided flycatcher, Vaux's swift, pileated woodpecker, western toad, Cascades frog, Columbia spotted frog, bull trout, and Westslope cutthroat trout.

Gray Wolf

Wolves are highly social animals with large home ranges that include a variety of habitat types. Key components of wolf habitat include: (1) Sufficient, year-round prey base of ungulates and alternate prey (i.e., beaver and smaller mammals), (2) Suitable and somewhat secluded denning and rendezvous sites, and (3) Sufficient space with minimal exposure to humans (USFWS 1987). Wolf distribution is largely

influenced by distance from human activity, and wolves are highly susceptible to human-caused mortality.

Wolves were previously extirpated from the North Cascades, but in the past 20 years, the animals have been seen roaming in the vicinity of Ross Lake (NPS 2004). Locations of other sightings in the North Cascades include the Pasayten Wilderness, Twisp River drainage of the Okanogan National Forest, and Glacier Peak Wilderness. Gray wolves have not been sighted in the Stehekin Valley below High Bridge in the past 10 years, although suitable habitat exists. There is currently no USFWS recovery plan for wolves in the North Cascades.

Grizzly Bear

Grizzly bears are habitat generalists whose key habitat requirements are the availability of food and isolation from humans (USFS 1989). The bears usually move along an elevation gradient to take advantage of seasonal foods. Grizzlies commonly use low-elevation riparian areas and wet meadows during spring and higher elevation meadows, ridges, and open brush fields during summer. Forests become a more important habitat component during late summer and fall.

According to the USFWS (USFWS 2004), the North Cascades region contains habitat that is capable of supporting a self-sustaining population of grizzly bears. However, only a "remnant" population remains, incapable of enduring without active recovery efforts, including possible augmentation with bears from other areas. A recovery plan for North Cascades was approved in 1997, but has not been implemented due to lack of funds. Grizzly bears have not been sighted in the Stehekin Valley below High Bridge in the past 10 years, although suitable habitat exists.

Canada Lynx

Lynx are associated with subalpine and boreal forests throughout their range (Witmer et al. 1998; Aubry et al. 1999). The species requires a mosaic of forest seral stages connected by stands suitable for travel cover. Lynx use late-seral forests for denning and rearing young and use early-seral forests for foraging (Aubry et al. 1999). Primary prey is snowshoe hare, although lynx will take other prey, particularly when hare density declines.

A vertebrate inventory conducted in 1990 and 1991 documented snowshoe hare presence in the Stehekin Valley. There have been at least four unconfirmed sightings of lynx in the lower valley (below High Bridge) between 1975 and 2000. If any of these sightings were lynx and not bobcats, it is likely that the animals were passing through the area and not residents, as the lower valley is not considered typical lynx habitat. Lynx generally use higher elevation (above 3,000-4,000 ft) lodgepole pine, subalpine fir, and/or Engelmann spruce forests.

Western Gray Squirrel

In most portions of their range, western gray squirrels are associated with mixed oak and conifer areas (Gilman 1986; Foster 1992; Ryan and Carey 1995a). Oak provides food (i.e., acorns), maternal nest sites, and seasonal cover and travel corridors; conifers provide year-round cover, travel corridors, nests sites, and cone seeds (Ryan and Carey 1995a, b; Linders 2000). In addition to oaks, pines appear particularly important as sources of hard mast for the squirrels. In areas occupied by western gray squirrels that lack oak trees, such as the Stehekin Valley, ponderosa pine generally replaces oak as the primary hard mast species. Hardwood trees other than oak are also used by western gray squirrels, and studies generally indicate that western gray squirrels prefer stands with a greater diversity of trees over stands with fewer tree species (Gilman 1986; Ryan and Carey 1995a). Western gray squirrels are known to occur in the lower Stehekin Valley and are expected to be most abundant in mixed conifer-hardwood forests that provide a diversity of food sources.

Bats

The Stehekin project area vicinity contains potential habitat for five bat species that are considered federal species of concern: the long-eared myotis, long-legged myotis, Yuma myotis, fringed myotis, and Townsend's big-eared bat. Each of these species is known to occur is coniferous forests, and the availability of roosting areas (for resting and for maternal sites) is an important habitat component for the bats. Roost sites range from cavities and loose bark in large trees and snags to abandoned buildings, caves, and crevices in rock cliffs (Nagorsen and Brigham 1993). Older forests generally provide higher quality roost sites than younger forests (Christy and West 1993). Most roosting bats are extremely sensitive to human disturbance.

Long-eared myotis, long-legged myotis, and Yuma myotis are known to be present in the Stehekin Valley. Fringed myotis and Townsend's big-eared bat have not been detected in the valley however there is suitable habitat. In the vicinity of the project road alignment, most of the trees are too small to provide high-quality roost sites, although scattered large Douglas-fir and other large trees are present and do provide potential roost sites.

Bald Eagle

Bald eagles are associated with riparian and open water habitats (i.e., rivers, lakes, and bays) with large trees and adequate prey (i.e., fish and/or waterfowl) concentrations. Nests are generally in the tallest tree in a stand, and nest sites are usually within 0.25 mile of large bodies of water (Montana Bald Eagle Working Group 1991). In most areas, absence of intense human activity is also an important factor in nest site selection (Stinson et al. 2001).

Important habitat components for wintering eagles include concentrations of prey in areas with tall trees that provide suitable perch and roost sites (Stalmaster 1987; Stinson et al. 2001). As with the nesting period, the level of human disturbance also influences wintering habitat quality.

For the Stehekin project, the nearest known bald eagle nest is located over 3 miles from the road alignment. The nest was first identified in 2001 and has been active ever since. Based on incidental observations, eagles occasionally use portions of the river adjacent to the road alignment (Kuntz 2004). Bald eagles are occasionally seen perched in large trees at the head of Lake Chelan during the fall and winter. During this period, eagle use of the portions of the river adjacent to the road alignment is expected to be rare.

Northern Spotted Owl

Spotted owls prefer mature or old growth forests that are structurally complex (i.e., forests that contain trees of several species, sizes and ages; contain standing and down dead trees; and have multi-storied canopies). The project area contains suitable nesting and foraging habitat. The typical nesting season for northern spotted owls extends from March 1st to late summer/early fall.

There is one northern spotted owl nesting area in the vicinity of the project. The nesting area was first detected in 1998, when an adult pair and three juveniles were observed. The actual nest site was not identified. In 1999, adults again located in the general vicinity, but during three site visits in 2000, only the male owl was detected. During single site visits in 2001 and 2003, no spotted owls were detected. However, in 2004, a survey discovered activity that suggests that a nest is located in the vicinity of the road project (NPS 2004b).

The USFWS has established an Action Area for the northern spotted owl (USFWS 2005). This Action Area is a radius of 1,000 feet extending out from the nest tree in all directions. No construction work can occur within this area during the nesting season (March 1st to September 6th – this limitation may extend beyond September 6th depending on the age of any young owls – see mitigation measures under Alternative 2 below).

Harlequin Duck

Harlequin ducks occur in mountain stream environments during the breeding season. Their breeding habitat consists of clear, clean, fast-flowing, low-gradient (less than 3 percent) mountain streams (2nd order or larger) with rocky substrates and riparian bank vegetation (USFS 1992). Nests may be located on top of stable cutbanks, on side slopes of streams, on steep slopes, in undercut stream banks, in cliff cavities above the stream, and in piles of woody debris (MacCallum 2001), as well as in hollow trees and snags (Cassirer et al. 1993).

Surveys completed in the early 1990s concluded that 7 to 11 pairs nest along the Stehekin River between High Bridge and the head of Lake Chelan. Harlequins arrive in April and start nesting by the beginning of May. Young are usually first seen on the Stehekin River and its tributaries by late June - early July. Males leave the river by early July, migrating back to the Pacific Coast. Females and juveniles return to the coast in August to early September.

Northern Goshawk

Goshawks use large tracts of mature and old growth forest where they can maneuver in and below the canopy to forage, and where large trees are available for nesting (Squires and Reynolds 1997). Foraging areas for this species typically include a greater diversity of forest age classes and structural characteristics (e.g., snags, woody debris) than nesting areas (Squires and Reynolds 1997).

Kuntz and Glesne (1993) documented the occurrence of northern goshawks in upland mesic coniferous forests and in deciduous riparian forests within the Stehekin Valley. Goshawk nests were noted on the east side of Lake Chelan. Recently, fledged goshawks were seen above High Bridge. Evidence of old nests suggests these areas have probably been used for many years. In the vicinity of the Stehekin project road alignment, suitable goshawk nesting habitat is present but rare.

Olive-Sided Flycatcher

The olive-sided flycatcher occurs in virtually all forested areas of Washington State. Smith et al. (1997) consider the olive-sided flycatcher an edge species that occurs throughout forested areas where forest stands are adjacent to open areas (such as clearcuts, burns, and montane meadows). Within the Stehekin Valley, Kuntz and Glesne (1993) and Smith et al. (1993) documented these flycatchers using deciduous riparian forests along the Stehekin River.

Vaux's Swift

Vaux’s swifts require large, hollow snags or cavities in the broken tops of live trees for nesting and night roosting (WDNR 1996). Bull and Cooper (1991) documented 21 Vaux’s swift nests in a study in northeastern Oregon. All 21 nests were in large grand fir trees (26.4 in mean dbh) hollowed out by a fungus and with an entrance excavated by pileated woodpeckers. The nest trees were mainly in old-growth stands. In a second study in northeastern Oregon, Bull and Hohmann (1993) found considerably more Vaux’s swift nests in old-growth stands than in stands that had been logged in some manner. Occurrence of swifts appeared to be related to the number of dead grand fir trees that were at least 20 inches diameter at breast height (dbh) (Bull and Hohmann, 1993). Interestingly, swift nests were found in

harvested areas if hollow trees were left (Bull and Hohmann, 1993). Bull and Beckwith (1993) reported that Vaux's swifts show a strong preference for foraging over open water.

Park studies (Kuntz and Glesne 1993) have documented this species as regularly occurring in the Stehekin Valley from May through September. Within the vicinity of the road project, Vaux's swift are expected to nest in low abundance, due to the uncommon occurrence of large, hollow trees. These birds likely forage over the Stehekin River.

Pileated Woodpecker

Pileated woodpecker nesting habitat consists of mature and old growth forests, as well as previously harvested stands that contain remnant large trees and snags. Dead trees are preferred over live trees for nesting and roosting, and nest trees are usually over 25 inches dbh in stands with at least 60 percent canopy cover (Bull et al. 1990; Bull and Holthausen 1993). Most foraging occurs in logs and dead trees at least 6 inches dbh, although large diameter (i.e., greater than 12 inches dbh) dead wood is used most frequently (Bull et al. 1990). Pileated woodpeckers use a wider variety of forest conditions for foraging than for nesting, and the availability of nesting habitat is considered a limiting factor for the species.

It is estimated that approximately three to four pairs are resident within the Stehekin Valley (Kuntz and Glesne 1993). In the vicinity of the Stehekin project road alignment, suitable pileated woodpecker nesting habitat is present but rare, due to the infrequent occurrence of large trees and snags.

Western Toad

Western toads breed in marshes, small lakes, and slow-moving streams (Leonard et al. 1993). Outside the breeding season, adults live underground and can be found adjacent to their breeding habitat or in upland brush, grass, or forests, particularly near seeps (Corkran and Thoms 1996; Loeffler 1998). Western toads are the most frequently observed amphibian species in the Stehekin Valley, and the slow-moving portions of the Stehekin River in the vicinity of the project area are expected to provide breeding habitat for the species.

A survey conducted in 1991 (Kuntz and Glesne 1993) documented Cascades frog (*Ranacascadae)*, western toad *(Bufo boreas)*, and Columbia spotted frog (*Rana luteiventris)* in a variety of moist habitats in the valley. There have been no recent observations of tailed frog (*Ascaphus truei)* in the Stehekin Valley. However, there is suitable habitat for both species.

Cascades Frog

Cascades frogs occur in lakes, ponds, and small pools and marshy areas adjacent to streams, almost always above 2,000 ft elevation (Leonard et al. 1993). A survey conducted in 1991 documented Cascades frogs in a variety of moist habitats in the Stehekin Valley (Kuntz and Glesne 1993). In the project area, side channels of the Stehekin River may provide breeding habitat for the species.

Columbia Spotted Frog

Spotted frogs generally occur along shallow, marshy edges of ponds, lakes, and slow-moving streams (Nussbaum et al. 1983; Leonard et al. 1993). A survey, conducted in 1991, documented Columbia spotted frogs in a variety of moist habitats in the valley (Kuntz and Glesne 1993). In the project area, side channels of the Stehekin River that contain marsh vegetation may provide breeding habitat for the species.

Bull Trout

Bull trout exhibit two distinct life history strategies: resident and migratory. Resident bull trout, which are typically much smaller in physical size than migratory bull trout, spend their entire lives in headwater streams. Migratory populations move upstream into headwater streams to spawn, then after rearing in headwater areas, juveniles migrate downstream to larger rivers, lakes, or the ocean where they mature before returning to spawn (Reiman and McIntyre 1993). Spawning occurs in the fall and emergence is in the spring. Optimal habitat is characterized by clear, cold waters having gravel and cobble substrates free of fine sediments, abundant instream cover, and deep pools (Reiman and McIntyre 1993). Bull trout exhibit somewhat more specialized life history requirements and behavior than other salmonids in that strong bull trout populations are associated with high channel complexity and the coldest stream reaches within basins (Reiman and McIntyre 1993). Bull trout feed on invertebrates and fish, but are highly piscivorous (fish eating) as adults.

Bull trout inhabiting systems draining into the Columbia are considered part of the Columbia River Distinct Population Segment (DPS). Identified risks to bull trout populations include harvest, habitat disruption, introduction of species (particularly brook trout), and population fragmentation (Lee et al. 1997). Historically, bull trout inhabited the Stehekin River and Lake Chelan, but the last confirmed report of bull trout in Lake Chelan was in 1957 and it is believed that they may have been extirpated from the basin (NPS 1995). However, in 1993 there were several unconfirmed reports of bull trout being captured in the Stehekin River. Therefore, the National Park Service maintains bull trout habitat in the Stehekin River to protect any potential remaining populations and to preserve the option of species restoration. Critical habitat for bull trout was recently proposed for designation by the federal government (October 2004). The critical habitat designation for bull trout would include the Stehekin River.

Westslope Cutthroat Trout

Typical of many salmonids, westslope cutthroat trout also exhibit both resident and migratory life history strategies. Spawning occurs between March and July (Behnke 1992; McIntyre and Rieman 1995). Spawning habitat for westslope cutthroat trout occurs in low-gradient stream reaches that have clean gravel substrate. Proximity to cover, such as overhanging stream banks, is an important component of spawning habitat for adult westslope cutthroat trout. Westslope cutthroat trout fry generally occupy shallow waters near stream banks and other low-velocity areas (e.g., backwaters, side channels) while juveniles are most often found in pools and runs (McIntyre and Rieman 1995). Adult westslope cutthroat trout are strongly associated with cold, high-gradient waters that have pools and cover (Shepard et al. 1984; McIntyre and Rieman 1995).

Identified risks to westslope cutthroat trout populations are generally similar to those of bull trout and include harvest, habitat disruption, and competition and hybridization with introduced species (Lee et al. 1997). Westslope cutthroat trout are present throughout the Stehekin River and its tributaries. However, populations below Bridge Creek are highly impacted from hybridization with rainbow trout (NPS 1995).

Threatened and Endangered Species Dismissed from Further Consideration

Several of the wildlife species listed in Table 6 are dismissed from further consideration, as none of the proposed alternatives are expected to have any effect on these species. These species include fisher, wolverine, American peregrine falcon, yellow-billed cuckoo, little willow flycatcher, golden eagle, merlin, flammulated owl, Lewis' woodpecker, black-backed woodpecker, and tailed frog. A brief description of these species, and rationale for the dismissal from further consideration, is provided below.

Fisher

Fishers are generally associated with late-successional, coniferous forests, frequently along riparian corridors (Ruggiero et al. 1994). Large snags and logs that provide denning and resting sites are important habitat components (Heinemeyer and Jones 1994; Johnson and Cassidy 1997). Fishers may use a wider variety of forest successional stages (i.e., both younger and late successional forests) for foraging. Core habitat zones on the east-slope of the Cascades include subalpine fir forests, although the species has also been detected in mid-elevation forests (Johnson and Cassidy 1997).

Recent inventories (Kuntz and Glesne 1993, Duke Engineering and Services 2000) did not document the presence of fishers in the Stehekin Valley, and on-going surveys by the NPS have not documented the species in the area (Christopherson and Kuntz 2004). Consequently, the proposed action is expected to have no effect on fishers.

Wolverine

Wolverines occur in a wide variety of vegetation types within remote, mountainous areas. Within these wilderness environments, availability of adequate year-round food sources (i.e., ungulates and small mammals) may be the most important habitat factor for wolverines (Ruggiero et al. 1994). The importance of specific vegetation components to wolverines is not well understood.

In Washington State, wolverines are most common in subalpine and alpine zones, and the animals occasionally descend into valleys during winter, when ungulate concentrations provide a food source (Johnson and Cassidy 1997). There are 2 records in NOCA's Wildlife Observation Database of unconfirmed wolverine observations in the Stehekin Valley in January 1974 and June 1983. Because the proposed action would not occur during the winter months, the only time period that wolverines may occasionally use the road alignment vicinity, the project is expected to have no effect on the species. In addition, loss of small amounts of vegetation would not impact wolverine wintering habitat or their ungulate prey.

American Peregrine Falcon

Peregrine falcons usually nest on high cliffs and buttes, near water where avian prey species are most common (Johnsgard 1990). The species forages on a large variety of birds, and birds that regularly fly high in a way that exposes them to the peregrine’s typical diving attack, namely highly mobile, flocking, and colonial-nesting species such as waterfowl and shorebirds. These species are particularly valuable prey (Johnsgard 1990).

The project area does not contain cliff habitat that would provide potential nest sites for peregrine falcons, and the birds were not detected in the Stehekin Valley during recent inventories (Kuntz and Glesne 1993, Duke Engineering and Services 2000). Consequently, the proposed action is expected to have no effect on peregrine falcons.

Yellow-Billed Cuckoo

Yellow-billed cuckoos occur in large blocks of riparian woodlands (i.e., 25 acres or more), particularly those dominated by cottonwoods and willows (USFWS 2001). In Washington State, the last confirmed breeding records for the species were in the 1930s, and the species may now be extirpated from the state (USFWS 2001). Yellow-billed cuckoos have not been detected in the Stehekin Valley, and the project area vicinity does not contain large patches of mature cottonwoods and other deciduous trees that are characteristic of yellow-billed cuckoo habitat. Consequently, the proposed action is expected to have no effect on this species.

Little Willow Flycatcher

Little willow flycatchers are associated with riparian areas that include willows (Smith et al. 1997; Siegel et al. [in prep]). There is only one little willow flycatcher record in the NOCA Wildlife Observation Database for the Stehekin Valley, an individual observed in June 1986 near the head of Lake Chelan. Given that: (1) Areas of dense willows are extremely rare in the project area, (2) Little willow flycatchers have not been observed in the vicinity in almost 20 years, and (3) The project would affect only small areas of riparian vegetation, the proposed action is expected to have no effect on little willow flycatchers.

Golden Eagle

Golden eagles are most commonly associated with open country, such as shrub-steppe, grasslands, open ponderosa pine forest, and large clearcuts (Watson and Whalen 2003). They nest on cliff ledges and in large trees. Mid-sized mammals, particularly rabbits, ground squirrels, and marmots, are the principal prey. The Stehekin Valley does not provide suitable golden eagle nesting habitat. However, during winter, golden eagles forage along the lower portion of the Stehekin River near the head of Lake Chelan, several miles downstream of the project road alignment. Because golden eagles do not typically occur in or near the project area, the proposed action would have no effect on this species.

Merlin

As with the golden eagle, the merlin is generally associated with open country (Sodhi et al. 1993). Primary prey of merlins includes small, open-country birds such as larks, swallows, and finches. Small mammals and insects are also occasionally eaten. The NOCA's Wildlife Observation Database contains three records of merlins seen in the Stehekin Valley (June 1986, May 1993, and September 1995). These records probably represent birds migrating through the valley, as the dense forests characteristic of the valley do not provide habitat for the species. Because the project area does not provide breeding habitat for merlins and because the species is expected only to pass through the area during migration, the proposed action would have no effect on merlins.

Flammulated Owl

Flammulated owls generally occur in open, mature and old-growth conifer forests containing yellow pines (Hayward and Verner 1994; McCallum 1994). Thickets of younger, denser trees appear important for roosting. Flammulated owls nest in cavities, almost always ones that have been excavated by woodpeckers (Hayward and Verner 1994; McCallum 1994; Powers et al. 1996). Limiting factors for the owls are probably the availability of nesting cavities and invertebrate prey (Hayward and Verner 1994).

Open-canopied mature or old growth forests with a significant ponderosa pine component are lacking in the Stehekin project area. Consequently, flammulated owls are not expected to occur in the vicinity. There are no records of the species' occurrence within the NOCA. Because it is unlikely that flammulated owls occur in the project area, the proposed action would have no effect.

Lewis' Woodpecker

Lewis' woodpeckers inhabit open woodlands and forests, often in burned areas (Lewis et al. 2002). There is one unconfirmed record in the NOCA Wildlife Observation Database of a Lewis' woodpecker at the head of Lake Chelan (May 1971). The dense forests that characterize the Stehekin Valley do not provide habitat for the species. Consequently, the proposed action would have no effect on Lewis' woodpeckers.

Black-Backed Woodpecker

The black-backed woodpecker occurs in montane and pine forests, where it is confined mostly to burned areas with abundant snags (USFS 1992; Dixon and Saab 2000). Recent burns provide outbreaks of bark beetles, which are the main prey for this woodpecker (Dixon and Saab 2000). In the absence of burns, this woodpecker will forage in areas with diseased trees. Most studies indicate that the species prefers to forage on dead trees rather than live trees (Dixon and Saab 2000).

There are three records of these birds being observed in the NOCA Wildlife Observation Database. All three records occurred between July 25 and August 13. They probably represent post-breeding movements. In the project area, black-backed woodpeckers are not expected to regularly occur, due to lack of high-intensity burned areas and diseased areas with abundant snags. Consequently, the proposed action is expected to have no effect on the species.

Tailed Frog

Tailed frogs are stream-breeding amphibians that occupy cold, rocky, mountain streams (Leonard et al. 1993). Adult tailed frogs occupy steam-side and forest habitats adjacent to streams. Tailed frogs are not expected to occur in the Stehekin River adjacent to the project road alignment, due to the relatively large size and low gradient of the river in this area. The frogs may occur in higher gradient streams above the Stehekin River and road alignment. However, the proposed action would have no effect on water quality or habitat in these areas, and consequently tailed frogs would be unaffected.

Environmental Consequences

Methodology

The environmental consequences analysis assesses potential impacts of the proposed alternatives on wildlife including threatened, endangered, and sensitive species. The thresholds of change for the intensity of an effect are described in the table below. Effects assessment was aided by field reconnaissance, review of acquired literature, survey results, and other information, and conversations with NPS and other federal agency staff.

Effect Intensity	Effect Description
Negligible	The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence and would be well within natural variability. This impact intensity equates to a USFWS “may effect, not likely to adversely affect” determination for T&E species.
Minor	The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable, but small and localized and not outside the range of natural variability. Mitigation measures, if needed to offset the adverse impacts, would be simple and successful. This impact intensity equates to a USFWS “may affect, not likely to adversely affect” determination for T&E species.
Moderate	Impacts on special-status species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present; animals are present during particularly vulnerable life-stages such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Mitigation measures, if needed to offset adverse impacts, would be extensive and likely successful. This impact intensity equates to a USFWS “may affect, likely to adversely affect” determination for T&E species.

Effect Intensity	Effect Description
Major	The action would result in a noticeable effect to viability of a population or individuals of a species or resource or designated critical habitat. Impacts on a special-status species, critical habitat, or the natural processes sustaining them would be detectable, both in and out of the park. Loss of habitat might affect the viability of at least some special-status species. Extensive mitigation measures would be needed to offset any adverse impacts and their success would not be guaranteed. This impact intensity equates to a USFWS “may affect, likely to jeopardize the continued existence of a species or adversely modify critical habitat for a species” determination for T&E species.
Other Qualifiers	**Description**
Beneficial Effect	An alternative that improves habitat value and function for wildlife including T&E species compared to existing conditions.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions be achieved for threatened and endangered species of wildlife in the park:

Desired Condition	Source
Federal- and state-listed threatened and endangered species and their habitats are sustained.	Endangered Species Act; NPS Management Policies; National Environmental Policy Act
Minimize human impacts on native plants, animals, populations, communities, and ecosystems in which they occur.	NPS Management Policies
Preserve and restore the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur.	NPS Management Policies

Impacts of the Alternatives

Effects of each alternative are described by species, or by group of species. Where the species in a group have similar habitat requirements or expected to be similarly impacted by the given alternative they are discussed together.

Alternative 1 - No-Action

Depending on location, timing, intensity, and duration of maintenance activities or emergency road work wildlife activities such as nesting, foraging, or other wildlife behavior (such as avoidance of the area) could be adversely affected by causing noise, dust, and increasing human activity. Smaller species such as snakes and lizards may be killed because they are not able to rapidly move out of an area. These adverse impacts would be short-term and negligible. Wildlife habitat may be lost or altered as a result of road maintenance and repair, particularly if emergency road reroutes are necessary. This would be a long-term adverse, minor impact. (See section below on bull trout and westslope cutthroat trout for impacts on fish species.) Impacts to specific species are described below.

Gray Wolf

Gray wolves have not been a sighted in the valley in over ten years. However, since suitable habitat exists there is the potential for gray wolves to forage or move through the area (it is unknown if they are there or not). If gray wolves were in the area during road maintenance it is likely that noise and human activity would cause them to avoid the area during the construction period. Thus, the adverse impact on wolves would be short-term and negligible.

Grizzly Bear

Similar to gray wolves, grizzly bears have not been sighted in the valley in over ten years, but suitable habitat exists. Therefore, it is possible that grizzly bears may occur in and use the project area. If grizzly bears were in the area during road maintenance it is likely that noise and human activity would cause them to avoid the area during the construction period as long as other attractants such as food or garbage was not available. Adverse impacts on grizzly bears would be short-term and negligible.

Canada Lynx

It is possible that lynx do occur in the project area, as there have been several unconfirmed sightings in the past as recently at 2000. Similar to gray wolves, lynx are likely to avoid areas of high noise and human activity. Therefore, adverse impacts on Canada Lynx would be short-term and negligible.

Bald Eagle

Because the only known bald eagle nest site is over 3 miles from the project alignment, disturbance effects to nesting eagles from road maintenance and repairs are not expected. Minor disturbance could occur to foraging or wintering eagles in the vicinity of road repair work, although most foraging and wintering eagle use is expected to occur along Lake Chelan, away from the project alignment. Road repair work is not expected to result in the removal of large trees that provide potential eagle nest, perch, and roost sites. Alternative 1 would have a short-term, adverse negligible effect on bald eagles.

Northern Spotted Owl

There is a high likelihood that northern spotted owls are actively nesting within approximately 470 ft of the roadway (the nest has not been found but there is activity in this area that suggests a nest). Road maintenance and repair work in this area could temporarily impact the birds, because of increased levels of noise and human activity, and potentially affect nesting success. However, no construction would be allowed to occur during the breeding and nesting season (March 1st to at least September 6th – see mitigation measures under Alternative 2 below) in the vicinity of the nest site. Foraging spotted owls may avoid the vicinity of road repair work, although adequate foraging habitat away from the roadway would remain. Under Alternative 1, potential adverse impacts to northern spotted owls could be short-term, but moderate in intensity.

Harlequin Duck

Disturbance from noise caused by road maintenance and repair work could affect the breeding and nesting success of harlequins, depending on the location, timing, intensity, and duration of the repair activity. However, the park would institute mitigation measures to avoid repair work during the breeding or nesting season. Thus with mitigation, adverse impacts on harlequin would be short-term and negligible.

Western Toad, Cascades Frog, and Columbia Spotted Frog

If road related repair work occurred in the river or stream channels near the road and resulted in a reduction in backwater and other slow-moving water areas, then potential breeding habitat for the frogs and toads could be impacted. This would be a short-term, adverse negligible impact. However, if rock stream barbs are constructed in the Stehekin River to control erosion, beneficial effects would result from the creation of pool habitat.

Other Birds, Bats, and Western Gray Squirrels

Depending on location, timing, intensity, and duration, vegetation removal and noise disturbance from road maintenance and repair work could affect other nesting or foraging species of concern (i.e., northern goshawk, olive-sided flycatcher, Vaux's swift, and pileated woodpecker) and their habitat. However, given the anticipated small area of vegetation impact, the general lack of large trees and snags in areas that may be impacted, and the anticipated short time period of road repair work, adverse impacts to these species are expected to be short-term and negligible.

Bull Trout and Westslope Cutthroat Trout

Though bull trout are not confirmed to be present in the Stehekin River, this impact analysis assumes that bull trout may occur in the project area, or that the Stehekin River within the project area may provide suitable habitat in the future. In addition, impacts to habitat are assumed to be similar for both bull trout and westslope cutthroat trout due to the relatively similar habitat requirements of both species.

Under the No-Action Alternative, any continued erosion of the road due to flooding would contribute to the amount of fine sediments being released into the river. Fine sediments can potentially fill in the spaces among gravel and cobble substrates necessary for successful spawning, and used as cover by juveniles and adults, thus degrading substrate conditions necessary for several life-stages of both bull trout and westslope cutthroat trout. Increased sediment can also alter other water quality parameters such as turbidity, dissolved oxygen, and biological oxygen demand that could potentially affect fish survival. However, in comparison to the total sediment load in the river, the potential sediment from the Stehekin Valley Road is very small and sediment from the road would rapidly dissipate (see Soils and Water Quality sections). Overall, the adverse impacts on the two fish species would be negligible and short-term.

Cumulative Impacts

Generally the short-term adverse impacts of Alternative 1 range from negligible for common wildlife, gray wolf, grizzly bear, Canada lynx, fish species, harlequin ducks, and other birds, bats, Western gray squirrels, and bald eagles and frogs and toads, to moderate for northern spotted owls. Long-term adverse effects from the loss of habitat are minor.

The cumulative effects of other projects generally results in additional impacts on wildlife including threatened and endangered species or other species of concern. These impacts are mostly the result of construction activities related to road repairs. The other activity that affects wildlife is the ongoing Forest Fuels Reduction Program. During road repair and maintenance adverse impacts to wildlife would occur because of increased noise, generation of dust and exhaust emissions and an increase in human activity in the area. This could result in species avoidance of the area, and disturbance of nesting or foraging behavior. These short-term impacts may be negligible in intensity for some species such as gray wolf and grizzly bear, but could by moderate for species such as northern spotted owls. Generally once construction repair or maintenance is complete then there are limited impacts from operation of the road. In some instances road improvements may result in less long-term impact to some species such as fish

and frogs and toads, particularly where the road is relocated away from the river (e.g., in an emergency situation). In these instances road repairs and maintenance would not occur in proximity to the habitat used by these species and there would be less potential for erosion and sediment from the road entering the habitat, thus there would be less disturbance over time. However, moving the road farther from the river could cause additional adverse impacts to other species such as northern spotted owls, particularly if this moves the road closer to a nest site or results in larger scale fragmentation of habitat.

The forest fuels reduction program is a past, present, and future action that would continue to impact both wildlife species and habitat. Species are disturbed by the presence of fire, smoke, and human activity and are likely to avoid the area of a prescribed burn either temporarily or permanently. The program also reduces or alters habitat in the selected burn areas. This activity could result in short-term and longer-term moderate adverse impacts on wildlife (the program also results in beneficial effects - see description under Alternative 2). Combining Alternative 1 with other past, present, and future actions would result in cumulative adverse impacts that are short to long-term and moderate in intensity.

Conclusion

Considering the potential adverse impacts on all the species listed above, Alternative 1 would generally have short-term, negligible adverse impacts on common wildlife, gray wolf, grizzly bear, bald eagles, Canada lynx, fish species, and other birds, bats, and Western gray squirrels, harlequin ducks, and frogs and toads, and short-term, moderate adverse impacts on northern spotted owls. Long-term adverse impacts on all wildlife species from loss of habitat would be minor in effect. Cumulative adverse impacts would be short to long-term and moderate in effect. Since there would be no major adverse impacts to wildlife including threatened and endangered species or species of concern, there would be no impairment of park resources or values.

Alternative 2 – Preferred Alternative

Generally adverse impacts to wildlife species and habitat resulting from Alternative 2 would be similar to Alternative 1 (Alternative 1 would have road repair and maintenance and could include new road construction in the event of an emergency – similar to Alternative 2). Construction activities would result in increases in noise, dust, and human activity. These would potentially result in wildlife disturbance including changes in foraging and nesting behavior and nesting success.

Alternative 2 would result in the loss of approximately 10 acres of habitat. Most of the habitat loss is at the road reroute areas (MP 7.0 and MP 7.5). This habitat loss would not generally occur under Alternative 1 (the exception would be if emergency road reroutes were needed because of flood damage). Some of the habitat loss in the road reroute areas (i.e., Bigleaf maple and cottonwood) is high value overstory habitat and while the amount of loss is small, any loss of this habitat type is a concern (see Vegetation section). In the road reroute areas an edge effect would be created as the overstory canopy would be divided with the road opening. This may have an effect on the relation of predator and prey and their habitat. However, Alternative 2 would reduce the need for continuing and ongoing road maintenance so that over the long term there may be less impact on wildlife habitat as compared to Alternative 1. Impacts to specific species are discussed below.

Gray Wolf

Impact to gray wolves would be similar to Alternative 1. Since wolves tend to avoid human activity and habitat for gray wolves is common in the area, adverse impacts on gray wolves would be short-term lasting for the duration of construction and negligible.

Grizzly Bear

Adverse impact to grizzly bear would be short-term and negligible, since the area of disturbance is small and grizzly bears tend to use the higher elevations in summer (during the period when construction is planned) and are less likely to be in the area at that time.

Canada Lynx

Canada lynx may also occur in the area, but would tend to avoid the area during construction. Since the area of disturbance is small compared to the available habitat, adverse impacts would be short-term and negligible.

Bald Eagle

Because the actions under Alternative 2 would occur outside of the eagle nesting period (Spring to mid-July), no disturbance effects to nesting eagles would occur. Minor disturbance could occur to eagles that forage along the Stehekin River during the late summer and early fall (when the construction and repair work would occur), although most foraging and wintering eagle use is expected to occur along Lake Chelan, several miles away from the project alignment. Potential areas where foraging eagles may be particularly disturbed by construction are locations where construction would occur close to the Stehekin River such as MP 5.3, MP 6.0, MP 7.5, and MP 8.0. Alternative 2 would not result in the removal of large trees that provide potential eagle nest, perch, and roost sites. Since there is no change to eagle habitat and changes to species behavior would be localized, Alternative 2 would have a minor and short-term adverse impact on bald eagles.

Northern Spotted Owl

Construction of the project within the Action Area of the spotted owl nest site would be scheduled to occur outside of the nesting period (March 1st to at least September 6th – see mitigation measures in this section). However construction activities do have the potential to disturb northern spotted owls that forage in the vicinity of the planned road repair and relocation work because of construction noise and human activity related to construction, although most spotted owl foraging is expected to occur in older forests away from the project alignment. Alternative 2 would not result in the removal of large trees that provide potential owl nest sites. The construction impacts of Alternative 2 would have a potential short-term, moderate adverse impact on northern spotted owls.

Clearing in the road reroute areas may also cause some fragmentation of northern spotted owl habitat. This can result in opening up the canopy and changing conditions of the stand, which can create opportunities for barred owls to move in and displace northern spotted owls. It is not anticipated that this would be a very likely occurrence, because the road reroutes would be located in relatively close proximity to the original alignment and do not involve extensive cuts through large tracts of northern spotted owl habitat. However, fragmentation of habitat could potentially affect northern spotted owl behavior in a localized area, and thus could result in long-term minor adverse impacts.

Moving the road closer to the northern spotted owl nest site (the location of the actual site has yet to be confirmed, however owl behavior in the area is indicative of nesting). This may cause future disruption to owl use of this nest site from operations on the roadway. If nesting behavior at this nest is disrupted by travel on the roadway this would cause a long-term moderate adverse impact. As part of design no pullouts would be constructed within line-of-sight of the area along the road that is immediately adjacent to the current spotted owl nest tree. This is to reduce the potential that park visitors will notice the nesting owls (i.e., potentially harass the birds) or that those owls would be attracted to people or vehicles.

Harlequin Duck

Alternative 2 has the potential to affect harlequin ducks, particularly in those areas of the project where construction work would occur in or near to the Stehekin River (i.e., MP 5.3, MP 6.0, MP 7.5, and MP 8.0). Construction related impacts include increased noise, dust, and human activity and temporary disturbance to riverbank habitat. However, the work proposed under Alternative 2 would occur outside of the breeding and nesting period for harlequin ducks, thus there would be no disturbance to breeding or nesting harlequins. There may be some slight adverse impact on foraging harlequin ducks. However, there is an abundant supply of foraging habitat for these species and they tend to start leaving the area near the end of July to return to the coast. In addition there would be a beneficial effect to harlequin ducks by the creation of riparian habitat from the bioengineering and rehabilitation of the riverbank at MP 5.3 and MP 8.0. Overall, Alternative 2 would have short-term minor adverse impacts on harlequin ducks.

Western Toad, Cascades Frog, and Columbia Spotted Frog

Because the actions under Alternative 2 would occur outside the breeding season for frogs and toads, no disturbance effects would occur. Alternative 2 is expected to result in a long-term reduction in erosion from flooding, and consequently a long-term potential improvement in frog and toad breeding habitat as a consequence of reduced sedimentation. Construction of the in-water erosion control structures would also have some beneficial effect on frogs and toads because it would create pool habitat and areas of slower moving water. Thus Alternative 2 would have short-term, negligible adverse impacts on these species.

Other Birds, Bats, and Western Gray Squirrels

Generally the roadwork would not affect birds and bats during the nesting season. However, minor disturbance from construction noise and human activities associated with construction could affect birds, bats, and squirrels that are present in the area and their foraging activities in the vicinity of the planned road repair and road reroute areas. However, the potential disturbance area is small relative to the availability of foraging areas in adjacent undisturbed habitat. Areas where vegetation would be cleared provide potential foraging habitat, but this loss of vegetation would be minimal relative to remaining foraging habitat in the vicinity. In addition, obliterating and revegetating the abandoned roadway segments would provide for replacement of foraging habitat in the long-term. Alternative 2 would not result in the removal of large trees that provide potential nesting and roosting sites. Thus, Alternative 2 would have short-term, minor adverse impacts on these species.

Bull Trout and Westslope Cutthroat Trout

The proposed actions under Alternative 2 may cause some disturbance effects in areas in close proximity to the Stehekin River channel, or as a result of in-water work. These include riverbank or in-water work at MP 5.3, MP 7.5, and MP 8.0. Work in or near the water includes constructing stream barbs, revetment work, slope stabilization, bioengineering (i.e., willow layering), and revegetating slopes. These activities in addition to clearing and grading have the potential to increase the amount of sediment or turbidity in the water. Increased sediment load and turbidity can adversely affect fish in several areas as described under Alternative 1 above.

However, these types of construction impacts can be reduced or eliminated through the use of best management practices (BMPs) such as temporary erosion and sediment controls (TESC). Revegetation of disturbed areas would protect soils from erosion and reduce the potential for erosion and long-term impacts to stream habitat. In addition, setting back the road from the river in the realignment areas would allow some additional room for channel migration processes that may locally improve fish habitat.

The following list is a brief summary of potential effects of the specific proposed activities.

- Culvert replacements at Wilson Creek require no in-water work in the Stehekin River itself, but in-water work would occur in Wilson Creek, and the slight alignment shift crossing Wilson Creek would result in some short-term sediment input into the Stehekin River downstream of the construction. There is also potential for some increased sediment from the slope stabilization work on the riverbank in this location.
- The road realignment at MP 6.0 in McGregor Meadows may introduce some sediment into the Stehekin River via a small creek within the realignment area. But this creek flows for about 1/4 mile through a low-gradient meadow prior to entering the Stehekin River, which would likely allow much of the sediment to settle out prior to entering the river. Because the realignment is far removed from the river, there would be no disturbance effects.
- Both the realignment at MP 7.5 and in-water and riverbank improvements at MP 8.0 have potential to impact fish habitat from increased sediment and turbidity. At MP 8.0, the addition of new in-river barbs would cause short-term disturbance and some limited sediment loading. However, the protection of the site from future erosion would reduce habitat impacts in the long-term. It would also create additional pool habitat, which is relatively scarce in the project stretch of river.
- The proposed rehabilitation and paving of 5.15 miles of Stehekin Valley Road would eliminate sediment runoff from the road, but would also increase impervious area by approximately one acre and slightly reduce infiltration. As discussed in the Stream Flow Characteristics Section, this reduction of infiltration would likely have no measurable effect on Stehekin River flows, but the delivery of contaminants such as petroleum products originating from the asphalt and automobile traffic may increase slightly.

It is expected that adverse impacts on fish populations and habitat under Alternative 2 would be measurable but small and localized and not outside the range of natural variability. Thus, adverse impacts would be minor and short-term. In addition, the construction of the stream barbs would increase the amount of pool habitat that is relatively scarce in the river reaches within the project area.

The Stehekin Valley Road project involves changes that benefit wildlife by improving habitat. Under Alternative 2, these include creating habitat by obliterating and revegetating abandoned road sections, rehabilitating riverbanks by planting native vegetation and stabilizing slopes, and creating fish habitat (pool habitat) by constructing rock stream barbs with overhanging vegetation (i.e., bioengineering, which also creates upland habitat).

NPS (and FHWA) have used the design process to reduce the intensity or duration for impacting wildlife or to reduce the impact altogether. For this project, the road design includes measures such as locating pullouts well away from sensitive nesting areas, avoiding the removal of large nest or perch trees, and minimizing needed cleared area to reduce impacts to wildlife. Where necessary mitigation measures would also be used to reduce wildlife impacts particularly related to construction activities. For example the following mitigation measures would be used:

- Implement and use construction BMPs to control erosion and sedimentation to minimize or eliminate impacts to fish from degraded water quality (refer to the mitigation measures in the Soils and Water Quality sections of the EA).

The following conservation (mitigation) measures related to northern spotted owls, bull trout, and other wildlife species were taken from the Biological Opinion produced by the U.S. Fish and Wildlife Service (USFWS 2005) for the project:

- No construction activities will take place within the Action Area between March 1 (the beginning of the spotted owl nesting season) and September 6, depending on the age of the fledgling spotted owls, as follows: work can begin on or after September 6 as soon as at least 4 weeks have passed since fledging of the spotted owl(s), if any. This determination will be done by the North Cascades Complex wildlife biologist.
- Construction activities will be carried out only during daylight hours to minimize effects to spotted owls.
- No pullouts will be constructed within line-of-sight of the area along the road that is immediately adjacent to the current spotted owl nest tree.
- The placement of rock barbs will be done outside the wetted channel. The rock will be placed in the channel using heavy equipment that will be on the road or bank above the ordinary high water line.
- All garbage will be taken off-site at the end of each working day.

The following reasonable and prudent measures with respect to northern spotted owls (developed by the USFWS in the Biological Opinion) would be implemented as part of the project:

- Monitor project implementation to ensure compliance with the conservation measures listed above, especially the seasonal timing restrictions and the final placement of the road near the spotted owl nest. Report the results of this monitoring to the USFWS. A North Cascades Complex biologist is to monitor the spotted owl nest to determine if the spotted owls produce young during the year(s) of project implementation (*Note: The biologist would also determine whether the spotted owl nest is occupied or has moved*.). If they do discover young, then the biologist is to estimate the age of the fledgling(s) as part of the timing restrictions described above.
- The NPS shall report the progress of the proposed action and its impacts on Federally threatened and endangered species, particularly northern spotted owls to the USFWS as specified in the incidental take statement in the Biological Opinion in accordance with 50 CFR §13.45 and §18.27.
- Any dead or injured Federally-listed species found in the Action Area shall be reported within 24 hours to a special agent of the USFWS, Division of Law Enforcement at (360) 753-7764, or to the USFWS Western Washington Fish and Wildlife office at (360) 753-9440. In addition, the USFWS is to be notified in writing within 3 working days of the accidental death of, or injury to, a northern spotted owl or of the finding of any dead or injured spotted owls during implementation of the proposed Federal action. Notification must include the date, time, and location of the incident or discovery of a dead or injured spotted owl, as well as any pertinent information on circumstances surround the incident or discovery. The USFWS contact for this written information is the Manager for the Western Washington Fish and Wildlife office.

Cumulative Effects

Alternative 2 would result in short-term negligible adverse impacts for gray wolf, grizzly bear, Canada lynx, and frogs and toads. It would produce minor short-term adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks. Long-term minor adverse impacts would result from the loss or alteration of upland habitat, which would affect all wildlife,

except for fish. It would potentially result in long-term moderate adverse impacts for northern spotted owls.

Generally, other past, present, or future actions have the potential to cause additional impacts to wildlife including threatened and endangered species and other species of concern. In the Stehekin Valley, these impacts are mostly the result of construction related activities (principally associated with the Stehekin Valley Road in the project area) and to the Forest Fuels Reduction Program. Construction activities can cause changes in nesting and foraging behavior such as avoidance of the area, increased mortality (this is not addressed in detail here because it is not anticipated that there would be a high rate of mortality to the species addressed in this EA), and loss of habitat. Construction generally produces temporary impacts, such as increased noise, dust, and human activity, but while these may be negligible in intensity for some species such as gray wolf and grizzly bear, they may be moderate in intensity for species such as northern spotted owls.

The other major activity in the project area that could affect wildlife is the Forest Fuels Reduction Program. This is an ongoing action that would continue to impact wildlife, because in the short-term species are disturbed by the presence of fire, smoke and human activity. Wildlife is likely to avoid areas while fires are occurring and some species may relocate on a more permanent basis. Longer-term benefits of the program are that fire and manual selective thinning can reduce tree diseases and insect infestation, prevent intense crown (tree canopy) fires from occurring, enhance growth in the understory by reducing shade, and improve the overall structure of the forest (i.e., maintaining a late successional stage forest). Habitat is also affected by this activity because habitat is reduced or altered by fire (this can be both beneficial and adverse). In the short-term, habitat is lost, which can adversely impact some wildlife species such as mice and shrews, however in the long-term fire can create more diverse vegetation that supports greater wildlife diversity.

The Forest Fuels Reduction Program is strictly controlled by the Park and timed to occur only under certain conditions to minimize impacts. However, there is some potential for a prescribed burn to get out of control and burn a larger area than intended (the Park would generally not allow any forest fuel reduction activities to occur during the breeding or nesting season of threatened or endangered species unless it was an emergency situation). This action could potentially have short-term and moderate adverse impacts on wildlife.

When the impacts of Alternative 2 are combined with other projects, the adverse impacts on wildlife including threatened and endangered species and species of concern would generally range from minor to moderate depending on the species. However, considering all potential actions together, the cumulative effect would result in short to long-term moderate adverse impacts.

Conclusion

Alternative 2 would result in: short-term negligible adverse impacts to gray wolf, grizzly bear, Canada lynx, and frogs and toads; short-term minor adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks; and long-term moderate adverse impacts for northern spotted owls. It would also have long-term minor adverse impacts from loss or alteration of habitat for all wildlife species except for fish and northern spotted owls (spotted owls would have long-term moderate adverse impacts). The overall cumulative adverse impacts would be short to long-term and moderate in intensity. Because there would be no major adverse impacts to wildlife including threatened or endangered species or species of concern there would be no impairment of the park’s resources or values.

Alternative 3 – Minor Improvements

Under Alternative 3 adverse impacts to wildlife would be similar to those that would result from Alternative 1. Construction under Alternative 3 and road repair and maintenance under Alternative 1 would both result in temporary increases in noise, dust and human activity lasting for the duration of the activity. The increased noise, dust, and human activity can disturb wildlife by causing behavioral changes including avoidance.

Alternative 3 would remove approximately 9 acres of habitat due to clearing, which would not generally occur under Alternative 1 (Alternative 1 may also require habitat loss if emergency road reroutes were needed because the road was damaged by flooding). However, Alternative 3 provides a benefit over Alternative 1, because it would reduce the need for continuing and ongoing road maintenance, which can disturb wildlife. Thus, over the long-term there may be fewer impacts to wildlife as compared to Alternative 1.

The potential environmental effects on wildlife including threatened and endangered species and species of concern would be similar to Alternative 2. The main difference would be that the potential for disturbance effects caused by construction noise and human activities would be slightly less for Alternative 3 than under Alternative 2, since this alternative involves less road repair and construction work than Alternative 2 (i.e., no work at MP 5.3, MP 6.0, MP 8.5 and a shorter road reroute at MP 7.5). However, the adverse impacts to fish and wildlife would still be similar to Alternative 2 and be short-term and negligible to minor in intensity for most species, because the impacts are localized and occur mostly during the construction period. The exception would be for northern spotted owl, where potential adverse impacts would be long-term and moderate in effect, because the road would be moved closer to an owl nest site. There would be longer-term adverse minor impacts from loss of upland wildlife habitat.

Since this alternative would not provide any bank stabilization in the Wilson Creek area, there is potential for slope failure in this area. If the slope were to fail it could result in additional sediment loading into the river and produce temporary adverse impacts on fish and other aquatic organisms. However, since the Stehekin River would flush the sediment relatively rapidly away from the failure site this effect would be negligible and of short-term duration.

Mitigation measures would be similar to Alternative 2. Benefits to wildlife including the creation of fish (pool) habitat, rehabilitating riverbanks with vegetation, and restoring abandoned road sections would also be similar to Alternative 2.

Cumulative Effects

Alternative 3 would result in short-term negligible adverse impacts for gray wolf, grizzly bear, Canada lynx, and frogs and toads. It would produce minor short-term adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks. Long-term minor adverse impacts would result from the loss or alteration of upland habitat, which would affect all wildlife, except for fish. It would potentially result in long-term moderate adverse impacts for northern spotted owls.

As with Alternative 2, other projects involving construction (mainly related to road improvements to the Stehekin Valley Road) and the Forest Fuel Reduction Program have or will have cumulative effects on wildlife. Construction activities may result in increased noise, dust generation, vehicle emissions, vegetation clearing, and human activity, and may also cause erosion and sedimentation to occur. These may affect wildlife in various ways depending on the species and may include behavioral changes to foraging and nesting activities, as well as avoidance of the area, and loss or alteration of habitat.

Similarly, the Forest Fuel Reduction Program also has the potential to adversely affect wildlife during prescribed burning and manual thinning. These activities result in increased human activity and fire and smoke that alter wildlife behavior and modifies habitat. Thus, the cumulative effects of Alternative 3 would be similar to Alternative 2 and the cumulative adverse impacts would be short to long-term and moderate in intensity.

Conclusion

Alternative 3 would result in: short-term negligible adverse impacts to gray wolf, grizzly bear, Canada lynx, and frogs and toads; short-term minor adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks; and long-term moderate adverse impacts for northern spotted owls. It would also have long-term minor adverse impacts from loss or alteration of habitat for all wildlife species except for fish and northern spotted owls (spotted owls would have long-term moderate adverse impacts). The overall cumulative adverse impacts would be short to long-term and moderate in intensity. Because there would be no major adverse impacts to wildlife including threatened or endangered species or species of concern there would be no impairment of the park's resources or values.

Alternative 4 – Reroute at MP 7.5

Construction under Alternative 4 would cause typical construction-related impacts such as increased noise, dust and human activity that can potentially result in adverse short-term impacts on wildlife, particularly if these activities occur during a sensitive breeding or nesting period or are located in close proximity to nest sites. These impacts would be similar to what would occur under Alternative 1 for road repair and maintenance. Alternative 4 would result in the loss of approximately 8 acres of upland wildlife habitat, which would generally not occur under Alternative 1 (Alternative 1 may result in clearing for emergency road repairs if the road is damaged due to flooding). Alternative 4 reduces the amount of wildlife habitat that would be lost compared to other action alternatives, because it would reduce the level of habitat loss by 2 acres and 1 acre over Alternatives 2 and 3, respectively. Similar to the other action alternatives, Alternative 4 would reduce the need for ongoing placement of gravel on the roadway and the resulting impacts of increasing noise, dust, and human activity associated with this work under Alternative 1.

Overall, the potential environmental effects on wildlife including threatened and endangered species or species of concern would be similar to Alternatives 2 and 3 except for northern spotted owls. Thus, Alternative 4 would result in: short-term negligible adverse impacts for gray wolf, grizzly bear, Canada lynx, and frogs and toads; and short-term minor adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks. And, long-term minor adverse impacts from habitat loss for all upland wildlife species.

Alternative 4 was developed to minimize the potential impact on the northern spotted owl nesting area. Under Alternatives 2 and 3 the road would be moved closer to the nesting area. Under Alternative 4, the road would remain in its present location, thus providing more buffer area from the nest site. Impacts such as noise from construction activities under this alternative would be slightly less than for Alternatives 2 and 3 because of the distance from the nest to the construction activity. However, construction activities and increased noise and human presence could still result in short-term moderate impacts to nesting owls (construction would not be allowed within the Action Area for northern spotted owls during the nesting period). The main difference between the action alternatives is that for road operations, Alternative 4 would be the least impacting to the owl nest site, because the road would be located farther away. This would make it more difficult to notice the birds and less likely that birds would be attracted to any people

or vehicles that may stop in this area (there would also be a slight decrease in the noise from vehicles because of distance). Thus, long-term operational impacts to northern spotted owls would be reduced over the other alternatives. Even so, operational impacts may have a long-term moderate adverse impact on northern spotted owls.

Mitigation measures would be similar to Alternative 2. Benefits to wildlife including the creation of fish (pool) habitat, rehabilitating riverbanks with vegetation, and restoring abandoned road sections would also be similar to Alternative 2. However, the benefits to fish and frogs and toads would be slightly greater under this alternative because of the additional stream barbs that would be constructed, which would create more pool habitat in Reach 2.

Cumulative Effects

Alternative 4 would result in: short-term negligible adverse impacts for gray wolf, grizzly bear, Canada lynx, and frogs and toads; short-term minor adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks; and long-term moderate adverse impacts on northern spotted owls. Long-term minor adverse impacts would result from the loss or alteration of upland habitat, which would affect all wildlife, except for fish.

Other road construction projects and the Forest Fuel Reduction Program have or will produce cumulative effects on wildlife. Construction in the area would mainly be related to improvements to the Stehekin Valley Road. Increased noise, dust, vehicle emissions, vegetation clearing, erosion, and human activity are generally associated with construction activities. Wildlife is affected in various ways by construction, which may include behavioral changes in foraging and nesting including breeding success. Clearing associated with road reroutes, construction of erosion control devices in the river, and creation of staging areas can result in the loss or alteration of habitat. The Forest Fuel Reduction Program may also adversely affect wildlife because of increased human activity, the generation of fire and smoke, and alteration of habitat. Thus, the adverse cumulative effects would be short to long-term and moderate in intensity.

Conclusion

Alternative 4 would result in: short-term negligible adverse impacts for gray wolf, grizzly bear, Canada lynx, and frogs and toads; short-term minor adverse impacts to other birds, bats, Western gray squirrels, bald eagles, bull trout, cutthroat trout, and harlequin ducks; and long-term moderate adverse impacts on northern spotted owls. Long-term minor adverse impacts would result from the loss or alteration of upland habitat, which would affect all wildlife, except for fish. Cumulatively, adverse impacts would be short to long-term and moderate in intensity. There would be no major adverse impacts to wildlife including threatened or endangered species or species of concern, thus there would be no impairment of the park's resources or values.

VISITOR EXPERIENCE

This section describes the visitor use and experience in the Stehekin River Valley in the vicinity of the project area and assesses the impacts of the proposed project on visitor use. It also assesses potential impacts to visitors using the Stephen T. Mather wilderness.

Affected Environment

According to NPS Management Policies (2001), the enjoyment of park resources and values by people is part of the fundamental purpose of all park units. The National Park Service is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and will maintain within the parks

an atmosphere that is open, inviting, and accessible to every segment of society. The mission statement of the NOCA complex states that NPS, "…is dedicated to conserving, unimpaired, the natural and cultural resources and values of the North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area for the enjoyment, education, and inspiration of this and future generations." One of the purposes of the North Cascades National Park Service Complex including the Lake Chelan NRA is to provide outdoor recreation use and enjoyment for the public.

The north end of Lake Chelan and the village of Stehekin serve as a gateway to the interior of the Lake Chelan NRA, Stephen T. Mather Wilderness, and North Cascades National Park. This is one of the few entry points on the southern end of the NOCA complex that is readily accessible to visitors. Similarly, the Stehekin Landing and the Stehekin Valley Road form the main route from this gateway into the NRA, wilderness area, and park. Thus, the Stehekin Valley Road is the primary access route for recreation and is an integral part of the visitor experience in this area. In 2003, over 35,500 people visited the Lake Chelan NRA (Allen 2004). This figure is down from a visitation level of 52,000 in 2000. Over 70 percent of the 2003 visitation occurred during the summer season, between June and September.

Visitor facilities are generally clustered around the Stehekin Landing and include overnight lodging, a restaurant, general store, and a marina that sells fuel. Located farther from the landing are a bakery and the Stehekin Valley Ranch, which provides lodging and guided backpacking, bicycle rentals, and horseback tours. Many of the visitor facilities only operate on a seasonal basis (i.e., during the summer months). Other facilities operate year-round to accommodate the approximately 100 year-round residents, as well as visitors.

Visitor activities include traveling by passenger ferry, floatplane, or trail into Stehekin. Once in the valley, activities include hiking, backpacking and camping, horseback and bicycle riding, white water rafting, guided shuttle tours, snowshoeing, nature viewing, and sight seeing.

The Stephen T. Mather Wilderness encompasses most of the Lake Chelan National Recreation Area. That portion of the Lake Chelan NRA that is outside the wilderness includes the Stehekin Valley Road and the area adjacent to the road. In the project area, the wilderness basically parallels the road on either side. At its closest point, the boundary of the wilderness is approximately 800 ft from the Stehekin Valley Road. There are several trails within the wilderness area that have views of the road and may hear noise emanating from the road including the Rainbow Loop Trail.

Environmental Consequences

Methodology

Public scoping input and observation of visitation patterns combined with assessment of what is available to visitors under current conditions were used to estimate the effects of the various alternatives in this document. The impact on the ability of the visitor to experience a full range of park resources was analyzed by examining resources and objectives as stated in the Park's statement of significance. The potential for change in visitor use and experience resulting from the alternatives was evaluated by identifying projected increases or decreases in the quality of the recreational experience and determining whether or how these projected changes would affect the desired visitor experience, to what degree, and for how long.

Effect Intensity	Effect Description
Negligible	Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of detection. Any effects would be short-term. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor use and/or experience would be detectable, although the changes would be slight and likely short-term. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
Moderate	Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.
Major	Changes in visitor use and/or experience would be readily apparent and have substantial long-term consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.
Other Qualifiers	**Description**
Beneficial Effect	The alternative would improve recreational resources and visitor experience compared with existing conditions.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to visitor use be achieved in the park:

Desired Condition	Source
Visitor safety and health are protected.	NPS Management Policies
Part of the purpose of the Lake Chelan NRA is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the park's management goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.	Lake Chelan GMP

Impacts of the Alternatives

Alternative 1 – No Action

Under the No-Action Alternative, visitor experience is likely to be adversely affected by existing conditions including dust generation, flooding of the road, and noise and reduced visual quality associated with road repairs and maintenance. Dust is generated by vehicles traveling on the gravel surface of the road and during prolonged periods of dry weather can coat vegetation near the road resulting in reduced visual quality. Dust can also be an irritant to tourists who are hiking, walking, bike riding, or horseback riding on or near the road. This is a long-term, but minor adverse impact on visitor experience.

Frequent flooding in the recent past has resulted in short-term road closures that have prevented visitor access via the Stehekin Valley Road to the upper Stehekin Valley and the interior of the Lake Chelan NRA and NOCA. Travel interruption and visitor inconvenience is an ongoing problem that detracts from the visitor experience.

Ongoing road maintenance or emergency road repairs may result in short-term noise impacts to visitors in the Stephen T. Mather wilderness area, depending on the location of the repair or maintenance work (e.g., the Rainbow Loop Trail is in the wilderness and is located in fairly close proximity to the Stehekin Valley Road). Peak construction noise levels at the boundary of the wilderness area (800 ft away) could be

approximately 67-69 decibels (dBA) (peak construction noise levels average approximately 91 dBA and generally there would be a reduction of approximately 22-24 dBA due to distance [Note: This is also dependent on topography and weather conditions]). This noise level is still higher than what is normally experienced in the wilderness area where quiet conditions are an important component of the wilderness. However, the noise levels would be reduced by distance from the construction activity and be temporary in duration so it is less likely that there would be a complaint about noise. Thus, the adverse impacts from noise would be short-term and minor in intensity.

Construction activities associated with road maintenance or emergency roadwork may also be visible from the wilderness area and this could have a short-term adverse impact on the visitor experience in the wilderness lasting the duration of the construction. Thus, under Alternative 1 the overall adverse impacts on visitor experience would generally be short-term and minor, except for dust generation, which would be a longer-term issue during dry weather periods.

Cumulative Impacts

Alternative 1 would have short and long-term minor adverse impacts on visitor experience. Other past, present, and future projects had or will have both adverse and beneficial effects. There has been and would be short-term adverse minor impacts such as increased dust along the road, and noise and visual quality effects in the wilderness area associated with road related construction on the Stehekin Valley Road and ongoing road maintenance. Other projects that involve road reroutes may cause minor short-term adverse impacts by moving the road closer to the wilderness area and increasing the potential for noise or reduced visual quality during construction. Visual quality impacts to the wilderness area could be more long-term if road work results in opening views of the road from the Stephen T. Mather wilderness area.

Other road projects that result in: (1) Straightening the alignment to improve sight distance, (2) Adding pullouts to facilitate traffic movement, (3) Making the road less susceptible to flooding, (4) Laying back slopes where steep slopes are next to the road to avoid material sloughing onto the road, (5) Paving the road to reduce dust and eliminate the development of potholes, and (6) Revegetating abandoned road sections would provide benefits to the visitor experience.

Another potential project affecting visitor experience is the Forest Fuels Reduction Program. Visitor visual quality may be adversely impacted in areas where prescribed burning is taking place in view of the Stehekin Valley Road. Many visitors may not be aware of the program and the benefits it provides, instead viewing this as an activity that is adversely affecting vegetation and wildlife. This would be a short-term, minor adverse impact on visitor experience. Combining the effects of other projects with Alternative 1 would result in short to long-term adverse impacts that would be minor in intensity.

Conclusion

Alternative 1 would have short and long-term minor adverse impacts on visitor experience associated with road repair and maintenance activities, road reroutes (under emergency conditions), and construction, which produce noise, dust, reduced or altered visual quality, and accessibility problems (temporary traffic delays on the Stehekin Valley Road). The cumulative adverse impacts of Alternative 1 would be long-term and minor in effect.

Alternative 2 – Preferred Alternative

Most of the adverse impacts to visitor use would occur due to construction and be prevalent during the construction period (i.e., relatively short-term). Construction would result in minor adverse impacts on visitor use by causing increased levels of noise and dust, degraded views, and delays in accessing the upper Stehekin Valley via the road. Increased noise and changes in visual quality could have a short-term minor adverse impact on visitors in the wilderness area. Construction would also likely result in wildlife avoidance in the vicinity, which would adversely affect wildlife viewing opportunities. There would be some change in the views from the road because the road would be rerouted away from the river in several places. This would replace the views of the river from the road with more forested views (whether this was a beneficial or adverse impact would depend on the viewer). There could also be some longer-term minor adverse impact on views from the Stephen T. Mather Wilderness area if the road corridor becomes more visible. In the event of future road flooding, visitor access to the upper Stehekin River could be disrupted causing inconvenience for visitors.

Compared to Alternative 1, most of these same impacts are likely to occur, except that for Alternative 1 these effects would be more long-term in nature because of the need for ongoing road maintenance (Note: the action alternatives [Alternatives 2, 3, and 4] would also require maintenance, but not to the same extent as under Alternative 1) and since road flooding is more likely to affect access under Alternative 1 than Alternative 2.

Following construction, visitor experience would generally be improved and benefit from Alternative 2. Access to the upper Stehekin Valley would be improved and the road would be more stable and less likely to fail during floods. Paving the roadway would eliminate dust, which would improve views of the adjacent vegetation; and decrease dust irritation to hikers, bicyclists, and horseback riders. Improvements to the road would also improve road safety: paving would remove the potential for potholes, increasing the number of pullouts would help facilitate traffic flow, and road re-grading would improve sight distance. These benefits would not be realized under Alternative 1. Other benefits include revegetating abandoned road sections and rehabilitating riverbanks with vegetation. Creation of pool habitat by constructing rock stream barbs may also increase the visitor experience for those who fish in the Stehekin River.

Potential mitigation measures to reduce the effects of Alternative 2 on visitor experience include the following:

- A public information program to warn of construction related road closures, delays, and road hazards would be implemented. This program would help to aid in mitigating any impacts on visitor's expectations and experiences. Notice should also be provided to equestrians (e.g., Stehekin Valley Ranch) because during construction hot asphalt could make the road temporarily impassable for horses crossing the road.
- Vehicle traffic would be managed within the construction zone and contractor hauling of materials, supplies, and equipment would be controlled to minimize disruptions in visitor traffic.
- A safety plan would be developed prior to the initiation of construction to ensure the safety of park visitors, workers, residents, and park staff.
- During construction, dust should be controlled (generally dust is controlled by minimizing soil disturbance, spraying water over disturbed soil areas during dry periods [no chemicals would be used to control dust], and revegetating disturbed soil areas as soon as practical following construction).

Cumulative Impacts

Alternative 2 would generally have short-term minor adverse impacts on visitor experience. An exception would be if the road corridor becomes more visible from the wilderness area, this would be a long-term minor adverse impact on visitor experience.

Other projects would produce adverse impacts that would be short-term and minor. These effects would mostly occur during construction (i.e., increased noise, dust, temporary restrictions in access and slight changes in visual quality), thus they would be localized and short-term. There may also be some long-term minor adverse impacts to visual quality from the Stephen T. Mather Wilderness if projects result in opening up views of the road. The Forest Fuels Reduction Program may adversely affect visitor experience by impacting visual quality. In areas where prescribed burning is taking place, visitors may find visual quality reduced because of changes to the vegetation. This would be a short-term, minor adverse impact on visitor experience. Combined with Alternative 2, the cumulative adverse impact on visitor experience would be long-term and minor.

In the long run and outside construction periods, Alternative 2 and other projects, particularly related to road improvements and the Forest Fuels Reduction Program would generally improve the visitor experience. Road improvements such as paving, controlling flood flows, improving sight distance, and adding pullouts would result in fewer problems for visitors accessing the upper Stehekin Valley. In addition, the roadway would be safer and less prone to failure from flooding, the road surface itself would be more enjoyable to drive on because it would be smooth, and views of the surrounding vegetation would not be covered in dust. Longer-term, the Forest Fuels Reduction Program would help to protect the forest from fires, create a healthier late successional stage forest, and create more diversity in habitat and wildlife.

Conclusion

Alternative 2 would have short to long-term minor adverse impacts on visitor experience because of increased noise and dust, reduced or altered visual quality, and delays in moving through the construction area. Cumulative adverse impacts would be long-term and minor in intensity.

Alternative 3 – Minor Improvements

Alternative 3 would involve construction and thus there would be construction-related impacts on visitor experience such as increased noise and dust, reduced visual quality, and short-term delays in access through the construction area. However, compared to Alternative 1, these impacts would generally occur once instead of being ongoing. The repair and maintenance work, as well as the continued generation of dust from having an unpaved road under Alternative 1 would result in long-term minor adverse impacts on visitor experience. Thus, compared to Alternative 1, this alternative would result in fewer impacts to visitor experience.

Similar to Alternative 2, construction would cause temporarily increased levels of noise and dust, degraded or altered views, delays in accessing the upper Stehekin Valley, removal of vegetation, and wildlife avoidance of the construction area. Construction related activities would reduce the visitor experience. Impacts to the Stephen T. Mather Wilderness would be similar to Alternative 2, with the exception of the Wilson Creek and MP 6.0 areas. No work would take place in these areas, which are closer to the Rainbow Loop Trail than the work areas farther north. Thus, construction impacts on the Stephen T. Mather Wilderness area may be reduced slightly as compared to Alternative 2. It is also likely that there would be no long-term impact to visual quality because the road corridor would not change near the Rainbow Loop Trail (this is the most likely location in the wilderness area to view the road). Also, the

construction period would be slightly reduced over Alternative 2, thus the duration of impacts would be reduced under Alternative 3. Overall the adverse impacts of Alternative 3 would be short-term and minor.

Similar to Alternative 2 this alternative provides beneficial effects that would not be realized by implementing Alternative 1. These include making the road safer and less prone to flood damage, which would improve access and result in less temporary road closures to repair the road. In addition, there would be less dust generated and the driving experience would be improved. Mitigation measures would be similar to Alternative 2.

Cumulative Impacts

Alternative 3 would have short-term minor adverse impacts on visitor experience resulting from construction related activities. Other road related projects would produce similar adverse construction impacts as those described for Alternative 3 (i.e., long-term minor adverse impacts). In addition the Forest Fuels Reduction Program may result in reduced visual quality, particularly in the short-term, and produce minor adverse impacts on visitor experience. The combined adverse impacts of past, present and future projects and Alternative 3 on visitor experience would be long-term and minor.

Conclusion

Alternative 3 would have short-term minor adverse impacts on visitor experience mostly resulting from construction activities (e.g., increased noise and dust, decreased visual quality, and reduced access along the road). Visitors in the wilderness would be less affected by construction than under Alternative 2 because work would not occur in proximity to the Rainbow Loop Trail within the wilderness area. Thus the adverse impacts of this alternative on visitors in the Stephen T. Mather wilderness would be short-term and negligible. The cumulative adverse impacts would be long-term and minor in intensity.

Alternative 4 – Reroute at MP 7.5

Compared to Alternative 1, this alternative would have similar adverse impacts because construction related activities under Alternative 4 and road repair and maintenance activities under Alternative 1 would have similar impacts. These include increased dust, noise, and access problems and reduced visual quality. One of the main differences between the two alternatives is in the duration of these impacts. Alternative 1 would produce both short-term and long-term adverse impacts while Alternative 4 would only produce short-term impacts. The other difference between Alternatives 1 and 4 is that Alternative 4 would also produce benefits that would not occur under Alternative 1. These include fewer problems accessing the upper Stehekin Valley, a safer road (the road would be less prone to failure from flooding), a more enjoyable driving experience (from paving the road, improving sight distance, and generating less dust and dust-coated vegetation).

This alternative would likely have less of an adverse impact on visitor experience related to visual quality in some respects as compared to Alternatives 2 and 3, because it would not reroute the road away from the river at MP 7.0. Thus the existing foreground views of the river would be maintained at MP 7.0. There would also be fewer disturbances to vegetation in this area, thus potential views of this road section would not be impacted as compared to Alternatives 2 and 3. The beneficial effects of this alternative may be slightly less than for Alternatives 2 and 3 because there would be no road reroute at MP 7.0, because more of the road would remain within close proximity to the Stehekin River. This may make the road in this area more susceptible to flooding and flood damage as compared to the other action alternatives, which could affect access. Other construction related impacts such as increased noise and dust, reduced visual quality, and delays in traffic movement through the construction area would be similar to Alternatives 2 and 3. In addition, road work would occur in the vicinity of the Rainbow Loop Trail and

there is the potential for long-term views from the Stephen T. Mather Wilderness to be altered. Thus, potential adverse impacts to visitor experience would be long-term and minor under Alternative 4. Mitigation measures would be similar to Alternative 2.

Cumulative Effects

Alternative 4 would have short-term minor adverse impacts on visitor experience related to construction activities and potential long-term changes in visual quality. Similarly, other road related projects have or would have similar adverse minor impacts related to construction. The Forest Fuel Reduction Program would also have short-term minor adverse impacts on visitor experience. Therefore, the cumulative adverse impacts would be long-term and minor.

Conclusion

Alternative 4 would have short to long-term minor adverse impacts on visitor experience due to construction impacts such as increased noise and dust, changed or altered visual quality, and traffic delays on the Stehekin Valley Road. Cumulative adverse impacts would be long-term and minor in intensity.

PARK OPERATIONS

This section describes the Stehekin Valley Road and its importance in maintaining the ability of staff to perform park operations. It focuses on the impacts of the road improvements on the function and usability of the road.

Affected Environment

The Stehekin Valley Road runs from the Stehekin Landing through the project area and continues into the Stephen T. Mather Wilderness. It is approximately 23 miles long and is paved for the first 4 miles between the Stehekin Landing and Harlequin Bridge. North of the Harlequin Bridge to the road end, the road is surfaced with gravel. In the project area, the road varies in width from 12 to 16 ft. The road is one-lane, with various segments that have sight distance problems (both vertical and horizontal curves). Traffic volumes are light because there are few vehicles in the area (access to vehicles is limited because there is no direct access to Stehekin by vehicle except to bring in a vehicle by boat). Most of the vehicles belong to residents, park staff, or park concessionaires (tour shuttles). NPS typically uses its own staff and vehicles to maintain the road (such as bulldozers, graders, dump trucks, etc.).

NPS owns and maintains the road for the Park. Annual maintenance may include filling potholes, grading the road, spreading gravel, and performing drainage work such as unclogging, replacing, or repairing culverts. To maintain the road during the winter, NPS hires a contractor who plows the road from the Stehekin Landing up to MP 9.15 so that access is maintained to this point. (Average monthly snowfall in Stehekin ranges from approximately 7 to 12 inches in March and November to 24, 40, and 44 inches in February, December, and January, respectively. Average annual snowfall is approximately 128 inches [Western Regional Climate Center 2004].)

The road is an important route for park staff in accessing the upper Stehekin Valley and the interior of the NOCA National Park Service complex. It is the road that would be used in emergencies such as fighting wildfires, transporting visitors out in an emergency situation (for example if a hiker or camper were injured), or evacuating residents during floods. It is also used for more routine operations, such as implementing the Forest Fuel Reduction Program, performing resource surveys, providing assistance to visitors, and protecting and managing Park resources.

Environmental Consequences

Methodology

The thresholds of change for the intensity of an effect on park operations are described in the table below.

Effect Intensity	Effect Description
Negligible	Park operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on park operations.
Minor	The effects on park operations would be detectable and would be of a magnitude that would not have an appreciable effect on park operations. If mitigation was needed to offset adverse impacts, it would be simple and likely successful.
Moderate	The effects on park operations would be readily apparent and result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation measures would be necessary to offset adverse impacts and would likely be successful.
Major	The effects on park operations would be readily apparent, result in a substantial change in park operation in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse impacts would be needed, extensive, and success could not be guaranteed.
Other Qualifiers	**Description**
Beneficial Effect	The efficiency of park operations would be improved and may also lower the cost of operation.
Duration of Effect	Short term – Recovers in less than 1 year; Long-term – Takes more than 1 year to recover.

Regulations and Policies

Current laws and policies require that the following conditions related to park operations be achieved in the park:

Desired Condition	Source
Park roads will be well constructed, sensitive to natural and cultural resources, reflect the highest principles of park design, and enhance the visitor experience.	NPS Management Policies

Impacts of the Alternatives

Alternative 1 – No Action

Under Alternative 1, the existing problems related to disruption of travel on the Stehekin Valley Road caused by periodic flooding would likely continue. In the past several years, flooding has resulted in washouts of complete sections of the road necessitating the construction of emergency road reroutes. This condition affects the ability of park staff to access areas both upstream and downstream of the washed out road areas and requires the devotion of staff time and resources to repair the road. Usually, it is possible to reestablish four-wheel drive access fairly quickly following floods. This work may require staff time to clear flood debris, perform primitive clearing and forest cuts, and make other emergency road repairs, or to hire contractors and oversee this work. During flood periods, road sections that are underwater would be temporarily closed to all park traffic, thus adversely affecting the ability of staff to access the interior of the park. (Another consequence is that even though it is usually possible to reestablish primitive access, road washouts may limit the ability of some park related activities to occur or to traverse the area. For example, park concessionaires may not be able to traverse the washout areas in buses to conduct tours.) The effectiveness of the road may be reduced for longer periods because repair of severely damaged

portions of the roadway is dependent on the availability of emergency funding. This may result in a short-term moderate adverse impact on park operations.

The continued need to maintain the Stehekin Valley Road with overlays of gravel is a long-term and minor adverse impact on park operations. Gravel is a long-term yearly cost to the park, and it is costly to import gravel to resurface the road (the local gravel pit at Company Creek may only be used in certain situations such as emergencies). This yearly cost would be reduced if the road was paved (park staff and resources are also required to oversee or perform the road maintenance work). An additional problem with the existing roadway is maintaining the road during the winter. Winter snowplowing damages the gravel road, and gravel and rocks in the road can damage the snowplow equipment. This is a long-term and minor adverse impact on park operations.

Cumulative Impacts

Alternative 1 would result in both short-term moderate adverse impacts and long-term minor adverse impacts on park operations. Any project (past, present, or future) that occurs within the Park has an effect on employees and park operations. Planning and implementing projects requires staff time, expertise, and assistance, which must be taken from more normal duties such as visitor contact, interpretation, resource protection, and safety activities. Floods that result in the need to make major repairs to the Stehekin Valley Road may cause short-term moderate adverse impacts on park operations, because staff time and park resources would be needed to respond to the flood damage. Typical construction impacts would include temporary delays for park staff and park related activities such as tour buses moving through the construction area. These produce short-term, minor adverse impacts on park operations.

Other projects have generally been undertaken to improve the effectiveness and usability of the Stehekin Valley Road. In-stream erosion controls and bank armoring have been used to protect the road's side slopes on the Stehekin River. Road reroutes and raising the road grade have been used to move the road farther away from the river and to protect the road from flooding. Future projects would also have similar goals, which typically provide long-term beneficial effects on park operations.

Combining the impacts of Alternative 1 with other projects would result in short-term moderate adverse impacts from the implementation of projects to repair flood damage and problems with access during construction, and long-term minor adverse impacts from maintaining the road during the winter.

Conclusion

Alternative 1 would have short-term moderate adverse impacts on park operations caused by planning and implementing projects to repair and maintain the Stehekin Valley Road and long-term minor adverse impacts related to winter snowplowing operations. In particular, moderate impacts are likely when large flood events occur and wash out sections of the roadway. There would be ongoing costs related to maintaining the gravel roadway such as acquiring gravel to resurface the road. Access for park staff through the area would continue to be a problem during road repairs or when the road floods. Snow removal operations would continue to damage the road (requiring additional road repair) and rocks and holes in the road would be more likely to cause damage to the snow removal equipment. Cumulative adverse impacts would result in short-term moderate and long-term minor impacts.

Alternative 2 – Preferred Alternative

Under Alternative 2 there would be short-term, minor adverse impacts from construction and increased work load for park staff. During construction, temporary delays would occur on the Stehekin Valley Road, which would affect park staff or park related activities such as tour buses moving through the

construction area. In addition, the typical work load for park staff would increase during the planning, design, and implementation of Alternative 2, because of the need to finalize project plans, hire contractors, and monitor construction. Once construction was completed, normal work load and work patterns should return to normal.

Park operations would benefit from the road and erosion control improvements proposed under Alternative 2. Rerouting the road to higher ground, raising the road height, stabilizing the riverbank, directing the erosive force of the Stehekin River away from the road, and laying back slopes to prevent material from sloughing onto the road would reduce the potential for road closures, temporary delays, and other access problems for park staff and park related activities. The effectiveness of the road would also be improved by paving the road, increasing sight distance, and providing pullouts to facilitate traffic movement. Also, paving the road would make snowplowing operations more efficient and reduce the potential for damaging the snowplow equipment. Once these improvements were completed it is likely that less staff time and park resources would be required to maintain operations on the Stehekin Valley Road.

Compared to Alternative 1, this alternative would have a more beneficial effect because it improves the effectiveness of the road in more ways. For example Alternative 2 would make the Stehekin Valley Road more flood resistant and less prone to flood damage and failure. It would also have less impact than Alternative 1, since the maintenance requirements would be reduced by paving the road.

Mitigation for potential adverse impacts on park operations includes:

- Contractors would provide and maintain park staff and emergency vehicle access through the project area during construction and would coordinate all work with park staff to reduce disruption in normal park activities.
- Construction workers would be informed about the special sensitivity of park values and regulations.
- Park resource specialists would be involved in inspections and monitoring and provide recommendations during the road rehabilitation work.

Cumulative Impacts

Alternative 2 would have short-term minor adverse impacts on park operations. The actions listed in the cumulative impacts scenario would have some degree of adverse impact on employees and park operations. Planning and implementing road related improvements to the Stehekin Valley Road and conducting the Forest Fuel Reduction Program would require staff time and park resources. There is also potential for additional large floods to occur over time, which could damage and wash out large sections of the Stehekin Valley Road. Large flood events would increase the amount of time staff spends on maintaining the effectiveness of the road. These projects would result in short-term moderate adverse impacts on park operations. The combined cumulative impacts of Alternative 2 and other projects would be short-term and moderate in intensity.

Beneficial effects would occur from improving the effectiveness and usability of the Stehekin Valley Road, similar to what was described under the Alternative 1 cumulative impact section. Constructed road improvements would reduce the amount of staff time and resources needed to maintain the road. Similarly, reducing the amount of forest fuels (while requiring staff resources to implement this program) could ultimately minimize potential large scale fires that could severely impact park operations and endanger resources.

Conclusion

Alternative 2 would have short-term minor adverse impacts on park operations. Following design and construction, Alternative 2 would provide beneficial effects to park operations by improving road safety, protecting the road from flood damage, and making snowplow operations more efficient. Cumulative adverse impacts would be short-term and moderate in intensity.

Alternative 3 – Minor Improvements

Alternative 3 would have similar adverse impacts on park operations as Alternative 2 related to restrictions on access during construction. However, since there would be fewer areas of the road that would be improved (i.e., no improvements at Wilson Creek and MP 6.0) there would be a slightly reduced level of impact because the construction area would be smaller and the construction period would be shorter. The level of park staff effort would also be slightly reduced under this alternative, because less construction work would occur and thus less monitoring would be needed. However, the level of intensity would still be detectable, thus construction would result in a short-term, minor adverse impact on park operations.

The beneficial effects of Alternative 3 would be similar to Alternative 2, except that there is a greater potential under this alternative for slope failure to occur at MP 5.3 (because no improvements are proposed at this site), which could necessitate emergency repairs to the road and cause increased staff time and resources to deal with this problem.

Compared to Alternative 1, Alternative 3 improves park operations by improving the effectiveness of the Stehekin Valley Road and reducing the commitment of staff time and resources to maintain the road. Potential mitigation measures for construction would be identical to those described for Alternative 2.

Cumulative Impacts

Alternative 3 would have short-term minor adverse impacts on park operations because of traffic delays resulting from construction and the need for staff time and resources to design and implement the alternative. Other projects would have similar impacts since they also involve construction and/or use of staff time and resources for implementation. Alternative 3 combined with other projects results in cumulative adverse impacts that are short-term and moderate in intensity.

Beneficial effects to park operations would occur for the other projects, as well as Alternative 3 following construction or implementation. These include reducing the potential for flood damage to the road, improving road safety, and reducing the risk of wildfire.

Conclusion

Alternative 3 would have short-term minor adverse impacts on park operations because of traffic delays resulting from construction and the need for staff time and resources to design and implement the alternative. Cumulative adverse impacts would be short-term and moderate in intensity.

Alternative 4 – Reroute at MP 7.5

Alternative 4 would require staff time and resources to implement this work (oversee the design and monitor the construction). This means that there is less time for more normal staff duties such as resource protection, visitor contact, and interpretation, which adversely affects park operations. In addition, park

staff and park related activities such as tour buses may be temporarily delayed from moving through the area during construction. These types of effects produce short-term, minor adverse impacts on park operations.

Overall, this alternative would improve park operations similar to Alternative 2, because the quality and effectiveness of the roadway would be improved. Even though there would be no road reroute at MP 7.0, riverbank improvements at MP 7.0 would help to protect the road from washout and temporary closures in these areas (however, there would be a slightly greater potential for the road to be damaged when compared with Alternatives 2 and 3).

Alternative 4 improves park operations as compared to Alternative 1 by improving the effectiveness of the Stehekin Valley Road to a greater degree than under Alternative 1, and by reducing the commitment of staff time and resources to maintain the road. Potential mitigation measures for construction would be identical to those described for Alternative 2.

Cumulative Impacts

Alternative 4 would have short-term minor adverse impacts on park operations as a result of traffic delays caused by construction and by the need to commit staff and park resources to implement the project. Other projects would have similar impacts on park operations and require the use of staff and park resources. Thus combining the effects of Alternative 4 with other projects would result in short-term moderate adverse impacts on park operations. However, all projects would generally provide various levels of long-term beneficial effect on park operations. These would result from improving the effectiveness of the road by increasing safety, reducing the potential for flood damage to the road, and reducing the need to commit staff and park resources to maintain the road.

Conclusion

Alternative 4 would cause short-term minor adverse impacts on park operations resulting from delays in access through the construction area and the need to use staff resources on the project. Cumulative adverse impacts would be short-term and moderate in intensity.

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U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Confederated Tribes of the Colville Reservation
Yakama Nation
Washington Office of Archaeology and Historic Preservation
Washington Department of Fish and Wildlife
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APPENDIX A

Draft Statement of Findings
Floodplain Management

Draft Statement of Findings/Floodplain Management

(J. Riedel 4-27-04)

INTRODUCTION

This statement of findings pertains to the NPS preferred alternative for maintaining and paving the Stehekin Valley Road in to Lake Chelan National Recreational Area. This road is the primary visitor access route and the only road to access private property upvalley.

Under the preferred alternative, the road would be maintained within the floodplain at two locations and involve bank stabilization at two others between Harlequin Bridge and Stehekin Valley Ranch. At McGregor Meadows the road crosses into the 100-year floodplain for approximately ½ mile, in an area where the river is changing channel locations and flooding of the road has become more frequent and severe in the last decade. Actions include raising the road at selected areas back to its original, near – grade elevation and installation of rock-cored humps beneath the road to prevent flood water from flowing down the road prism. At road mile 7, the road will be relocated to higher ground to avoid a direct conflict with the river, but will remain in the 100-year floodplain. At mile 8 and at Wilson Creek, the road will require some riverbank protection to keep it in its present location.

This Statement of Finding focuses on the two sites where the road will remain in the floodplain of the Stehekin River. It describes impacts associated with maintaining the road in these two locations, risks associated with the locations, and mitigation measures designed to minimize impacts to floodplain values.

SITE DESCRIPTION

The Stehekin Valley Road is located along the lower Stehekin River in the Lake Chelan National Recreation Area. The valley floor is relatively flat in comparison to near-vertical valley walls, and options for road relocation out of the floodplain or active geomorphic zones are very limited. The valley floor between Harlequin Bridge and the Stehekin Valley Ranch includes high terraces, low terraces, glacial moraines, flood channels, and the floodplain of the Stehekin River. The Stehekin Valley Road traverses several of these landforms, but is within the 100-year floodplain of the river at the McGregor Meadows and 7 mile locations.

Soils in McGregor Meadows and 7 mile areas are Stapaloop and Goddard series, which are poorly developed entisols in recent Stehekin River alluvium. They have sandy skeletal textures and few fine soil particles, and very little organic matter. In most locations, A, O and B soil horizons have not developed due to the recent age of the deposits.

Vegetation varies widely between the floodplain sites. At 7 mile, big leaf maple and shrubs are the dominant species, while in McGregor Meadows area Douglas fir is dominant with few shrubs or understory plants. McGregor Meadows was disturbed by historic farming activity in the early-to-mid 20th Century. At this time, native vegetation species and patterns have not recovered due to poor soils and recent activity of the river.

Most of the property in McGregor Meadows is owned by the NPS. However, there are several small private land holdings in the area, most of which have seasonal cabins. There are a few year-round residences. The NPS holds lifetime easements on several properties. At 7 mile, the proposed relocation within the floodplain is on federal land.

Justification for Use of the Floodplain

The NPS examined other alternatives to maintaining the road in the floodplain at 7 mile and McGregor Meadows in a Value Analysis in Spring 2003, and rejected the alternative of relocating the road to higher ground at this time. Factors in these decisions included a lack of suitable routes on higher ground, high costs, impacts on wildlife (spotted owl), impacts to vegetation, and impacts to private landowners and recreational use of the valley. Given this decision, there were two locations where the Stehekin Valley road will remain in the 100-year floodplain of the Stehekin River. Both locations are areas where the road has historically been flooded with the 100-year flood, and actions in the preferred alternative will not have adverse impacts to floodplain values.

Description of Site-Specific Flood Risk

Flood depths for the 100-year event in the 7 mile and McGregor Meadows areas are on the order of 2-3 ft (NPS, 1993). While main channel velocities are in the range of 8-9 ft/second, velocities on the left overbank along the road are on the order of 3-4 ft/second, which is more than enough to erode the loose sandy soils and the loose road fill. With these depths and velocities the road will be temporarily impassable during large flood events with a greater than 10 year return interval. Due to its location much closer to the active main channel of the Stehekin River, flood hazards at the 7 mile area are considered to be greater than at McGregor Meadows.

In the past 15 years, the Stehekin River has had six large floods. The November 1995 event was believed to have a 100-year recurrence interval, while the October 2003 event's recurrence interval is estimated by the USGS at 500 years. In addition to these exceptionally large floods, larger than normal spring floods occurred in 1997 and 1999, and 10-25 year recurrence events occurred in 1989 and 1990. At McGregor Meadows these floods have initiated a major realignment of the Stehekin River. Recurrence interval of flooding at the site has also changed with the passage of these large floods. In the 1980s, flooding of the site was infrequent, and limited to events of 10-year recurrence interval or greater. Due to floodplain and channel processes, the area now floods more frequently at lower discharges, and will likely be inundated at 10-year intervals during large fall and spring floods.

The amount of time required for warning of possible road flooding is on the order of a few hours to half a day. Flood waters will rise rather slowly at this site due to its current location some 500 ft or more from the active channel. Further, the National Weather Service is preparing a flood warning system for the valley.

There is high ground available immediately adjacent to both sites and a trail located ½ mile away for evacuation of the site if vehicles must be abandoned. Further, the shallow nature of flooding at this site allows the NPS to get heavy equipment through this area in emergencies.

Minimizing Impacts to Floodplain Values and the Public

The proposed actions will have minimal, but mixed beneficial and adverse impacts to floodplain natural resources. The road relocation at 7 mile will put the road on higher ground farther from the river. While this action will minimize flood risk to the road and people, it will have a detrimental impact on floodplain vegetation due to the road is relocation. However, to the extent practicable, plants from the reroute will be salvaged and used to obliterate and revegetate the abandoned road alignment, which will minimize impacts to floodplain vegetation.

At McGregor Meadows, the preferred alternative will result in slight changes in road elevation and appearance. However, since no major road relocation or realignment is planned, impacts to floodplain soils and vegetation will be minimal. Bringing the road up to previous grade at some sites and installing

humps will not result in higher floodwater elevations or greater water velocities. These actions will be designed not to impound or significantly impeded the movement of water through the area during flood stage – with the exception that the humps will prevent water from flowing down and following the road prism. Raising the road grade will provide a benefit to the public by allowing access to and from their homes during minor flood events.

The proposed action is not in a high flood hazard area, and work would be conducted at low flow periods on the river when there is no flood water at the site.

Paving of the road could have an adverse impact to water quality, particularly during installation. However, pavement will be laid during seasonal drought and runoff from the project should be minimal. **Use of cold mix has less effect on water quality?**

Paving of the road will improve floodplain values by reducing the amount of crushed road gravel that is currently washed into flood channels.

SUMMARY

This statement of findings accompanies an Environmental Assessment on impacts to the Stehekin River floodplain for actions designed to maintain the Stehekin Valley Road.

Passage of a record 500-year event in October 2003 precipitated some of the proposed floodplain actions, including road erosion and surface scour at Wilson Creek, McGregor Meadows, 7 mile and 8 mile locations. Actions in the preferred alternative are designed to minimize floodplain impacts by road relocations out of the 100-year floodplain where possible. At other sites, bank protection and road elevation changes will be required. These actions, including elevating the road surface and installation of rock barbs and bioengineering are designed to minimize impacts to the floodplain values and people because the actions will not alter native contours or increase flood depth or velocity.

APPENDIX B

Section 106 Documentation

Tom JAB 7/21/04
Dan A
cc: Alan Woodrow,
Tom Sent Fax Copy 7/21/k
cc Jesse
Bob M - Sent 7-26-04

STATE OF WASHINGTON

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July20, 2004

Mr. William Paleck
North Cascades National Park
810 State Route 20
Sedro-Woolley, Washington 98284-9394

Re: Proposed Stehekin Valley Road Repair
Log No.: 071904-48-NPS

WP

Dear Mr. Paleck:

We have reviewed the materials you provided to our office for the in proposed Stehekin Valley Road Repair Project in the Lake Chelan Recreation Area, Washington. Based upon this information we concur with your finding the proposed project will have no effect upon cultural properties included in the National and State Registers of Historic Places and the Washington State Archaeological and Historic Sites Inventories. Thus, no historic properties are affected.

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4). In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity should be discontinued, the area secured, and the concerned tribe's cultural staff and cultural committee and this office notified. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360)586-3080
email: robw@cted.wa.gov