National Park Service
U.S. Department of the Interior

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

EXECUTIVE SUMMARY

Draft Stehekin River Corridor Implementation Plan Environmental Impact Statement

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

August 2010

Executive Summary

This Draft Environmental Impact Statement (DEIS) analyzes a range of alternatives (management actions) to respond to the increased magnitude and frequency of flooding in the Stehekin River corridor within Lake Chelan National Recreation Area (Lake Chelan NRA or recreation area). The differences among the alternatives are primarily related to the way different management strategies are applied. These strategies are focused on the floodplain / channel migration zone, land use, and land acquisition and exchange.

The Alternatives (1 - 4) are based on the purpose and need for the project and conform to existing laws, policies, and planning documents, including the National Park Service (NPS) Omnibus Management Act (Public Law 105-392) and the Lake Chelan National Recreation Area General Management Plan / Environmental Impact Statement (GMP/EIS) (NPS 1995a).

The DEIS analyzes the potential environmental impacts that could result from the alternatives considered, including:

- Alternative 1: No Action (Continue Current Management Practices and Existing Plan Implementation)
- Alternative 2: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; More High-Priority Land Acquisition in Channel Migration Zone (Preferred)
- Alternative 3: At-Risk Public Facilities Removed from Channel Migration Zone in Most Areas; Same Land Acquisition as in Alternative 2
- Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less High-Priority Land Acquisition in Channel Migration Zone.

This DEIS has been prepared to satisfy the requirements of the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 42 U.S. C. 4321 - 4347, as amended), including the Council on Environmental Quality (CEQ) regulations found at 40 CFR 1500 - 1508 and other applicable laws; NPS *Management Policies 2006* (NPS 2006a); the NPS NEPA *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* (Director's Order 12) and handbook (NPS 2001a); and other management directives. This DEIS facilitates compliance with Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR Part 800), Section 7 of the Endangered Species Act, and other applicable laws and executive orders enacted for the protection of the environment.

This DEIS together with public and agency comments will be used to prepare a final environmental impact statement, which will then be used to support a Record of Decision for the proposed action (whichever alternative [or parts thereof] is selected).

Project Area Location

The project area includes the lower Stehekin Valley, from High Bridge to the head of Lake Chelan, including Weaver Point. No actions are considered in adjacent wilderness which begins above about 1,640 feet elevation in the lower valley (Figure ii-1: *Project Area—Lower Stehekin Valley* and Figure ii-2: *Existing Conditions*).

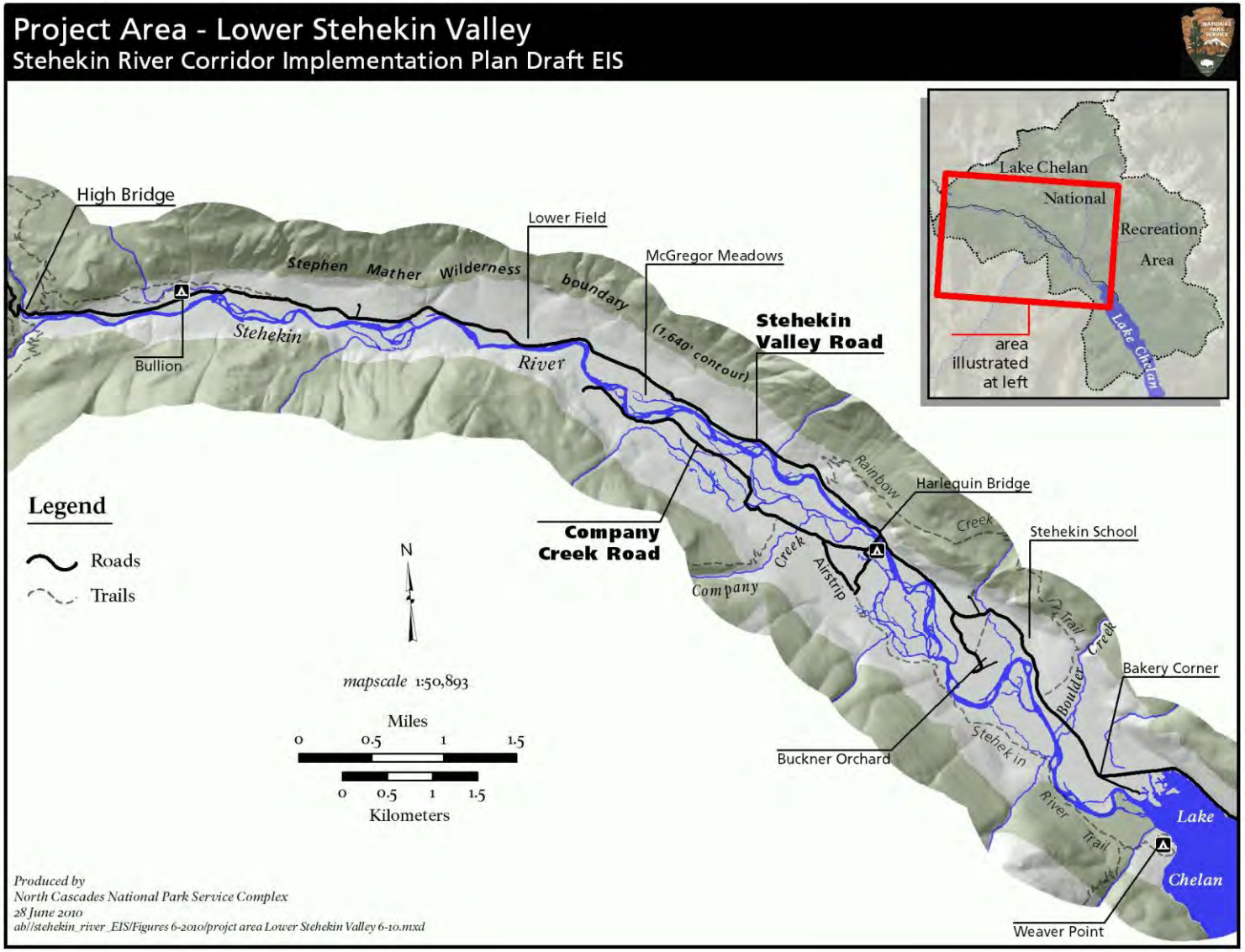

Figure ii-1: Project Area – Lower Stehekin Valley

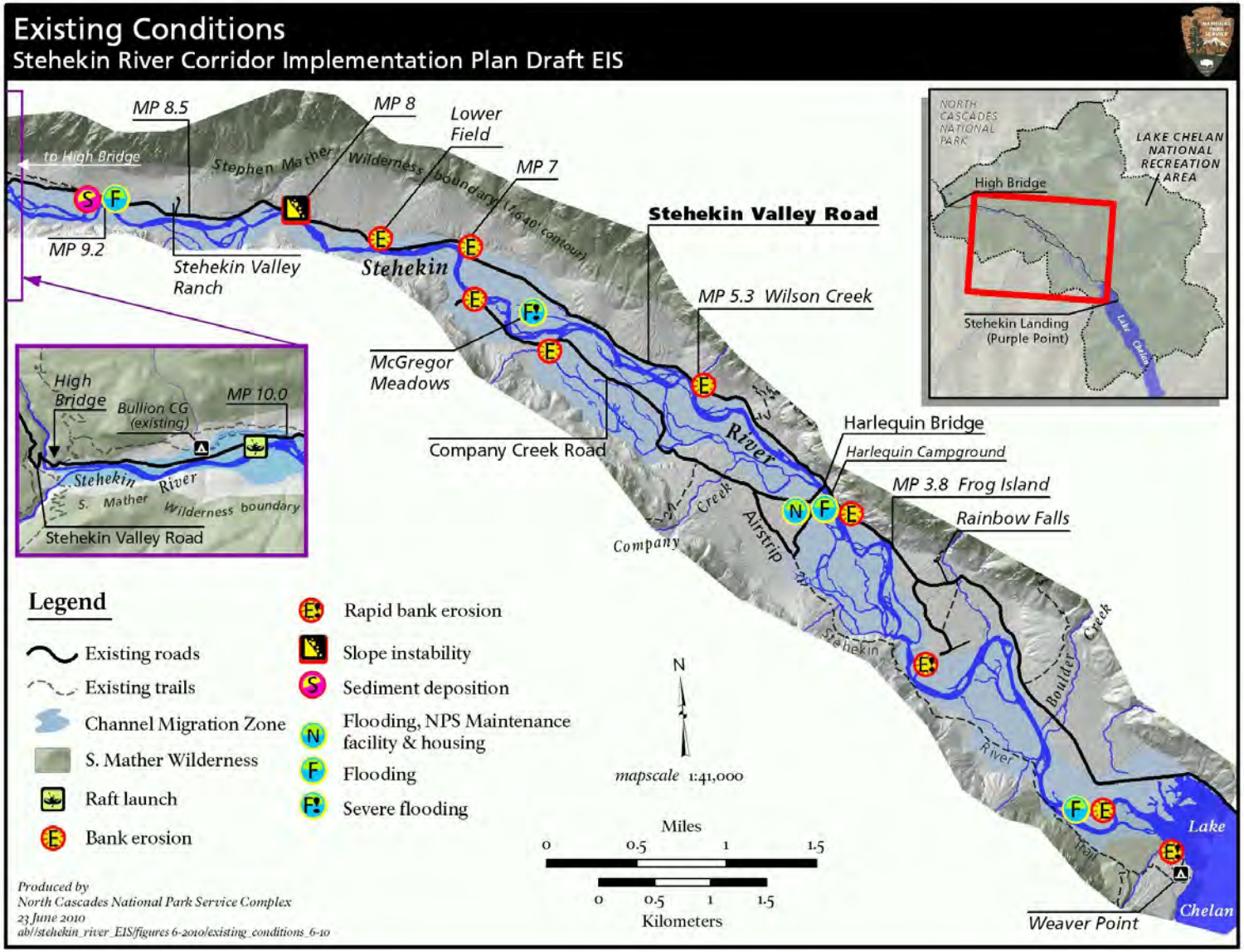

Figure ii-2: Existing Conditions

SUMMARY: PURPOSE OF AND NEED FOR MANAGEMENT ACTION

Recent major floods and resultant channel changes on the lower Stehekin River have intensified flood and erosion threats to NPS facilities and are impacting natural resources within Lake Chelan NRA. The three largest recorded floods on the Stehekin River since 1911 have occurred within the past 15 years, and in response, the NPS has spent more than $3 million to protect public roads and facilities and to repair flood damage. Roads, visitor facilities, and private development once thought to be safe from the river are now threatened. Because of the current impacts and future risks associated with these unprecedented conditions, the primary purpose of this implementation plan is to enable the NPS to meet goals and direction provided in the 1995 Lake Chelan NRA GMP (NPS 1995a). Goals for this plan include the following:

- Sustainably operate and maintain NPS administrative facilities, public access (roads and trails), and campgrounds;
- Protect water quality, scenic values, habitat, and natural processes of the Stehekin River; and
- Continue visitor services provided by the Stehekin Community, including those services and facilities found on private lands.

Photo 1 – Private Cabin, Well, and Septic System Incorporated into Logjam at McGregor Meadows (2003)

The NPS, the lead agency in the development of this DEIS, and the Federal Highway Administration (FHWA), the cooperating agency, have identified a need to evaluate comprehensive and sustainable management strategies and linked public-private actions to address the consequences of flooding. Floodplain utilization is embraced in this plan as the best approach for managing a flood-prone mountain river. This concept allows floodwaters to occupy the floodplain to achieve the benefits of slower, shallower flood water for all areas and is viewed as a sustainable approach over the long term. Consistent with past public-private partnerships on both sides of the river at McGregor Meadows and elsewhere in the valley, this plan seeks to develop new management strategies in partnership with private landowners where public and private concerns overlap. This implementation plan is needed to address several interrelated issues, which are to (1) respond to the increased magnitude and frequency of flooding, (2) implement and clarify 1995 GMP guidance, (3) sustain public facilities while protecting natural resources, (4) manage limited funding, and to (5) respond to private land-related concerns.

Primary Issues

(1) Respond to the Increased Magnitude and Frequency of Flooding. Prior to the late 20th century, the Stehekin River was prone primarily to spring snowmelt flooding (Figure ii-3*: Magnitude and Timing of the Annual Peak Flood on the Stehekin River*). Since the 1970s, however, the Stehekin River has become prone to large fall rain-on-snow floods, which rise quickly and occur from mid-October through December. Hydrologic data collected on the river since 1911 confirm the significance of this shift, as analyzed by the U.S. Geological Survey. The passage of severe floods in 1995, 2003, and 2006 has led to significant changes in the Stehekin River channel, and redefined the boundaries for the 100-year flood. The NPS has defined the channel migration zone, where the Stehekin River historically migrated in the valley over the past 1,000 years, as the effective floodplain regarding park management actions. As a result of this new flood regime, recreational and administrative facilities and developments once thought to be safe from the river are now threatened by flooding and bank erosion, while other sites in the floodplain have been compromised by larger, more frequent floods. Until now, the NPS has addressed problems on a case-by-case basis throughout the valley with the passage of each of these large floods.

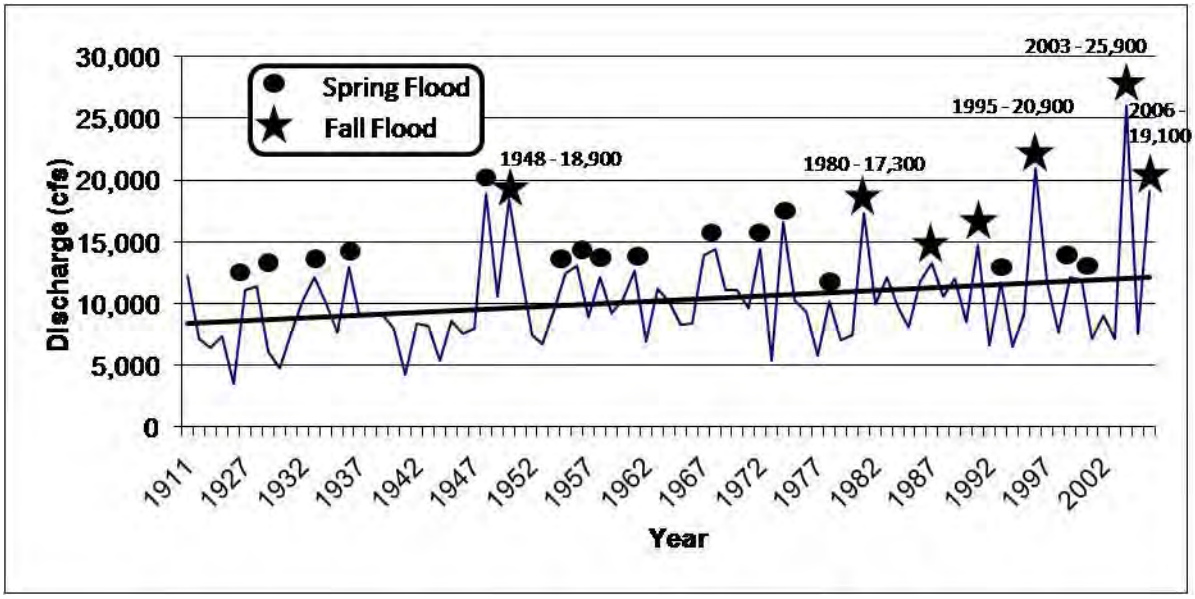

Figure ii-3: Magnitude and Timing of the Annual Peak Flood on the Stehekin River

(2) Implement and Clarify 1995 Lake Chelan NRA GMP Guidance. The GMP provides broad management guidance for Lake Chelan NRA, as well as some specific prescriptions to mitigate the risks and consequences of flooding (NPS 1995a). As a programmatic document, the GMP lacks the specific management direction needed to respond to the current circumstances imposed by the recent floods. Specific actions called for in the GMP that would be implemented in this plan include replacement and relocation of the maintenance facility and NPS housing out of the floodplain (NPS Tracts 06-118, 06-104, 06-121, and 06-122), construction of the Lower Valley Trail and continued maintenance of vehicle access on the Stehekin Valley and Company Creek roads. This implementation plan is needed to inform the location, design, construction, and implementation of these actions. Guidance provided by the GMP needs to be updated and clarified to reflect the dramatic increase in woody debris since 1995 and recognition of the influence of Chelan County Public Utility District (Chelan PUD) operations on the level of Lake Chelan and the lower Stehekin River. This implementation plan is also needed to evaluate and publicly disclose the direct, indirect, and cumulative impacts of proposed actions on the resources and values of Lake Chelan NRA.

(3) Sustain Public Facilities While Protecting Natural Resources. Management action is needed to provide long-term use and access to administrative and recreation facilities. Despite erosion protection and flood protection efforts by the NPS and private landowners, bank erosion continues to threaten public and private property. Channel changes have increased the rate of erosion and frequency of flooding at some sites, while decreasing erosion rates at others. Integrated management actions such as facility replacement and relocation, site-specific bank hardening, and limited manipulation of woody debris in the Lake Chelan backwater zone now need to be considered to ensure the long-term sustainability of infrastructure and protection of resources. Management of large wood and proliferation of bank-protection measures have the potential to impact federally- and state-listed species and to increase the spread of nonnative plants. These conditions underscore the need for updated assessment of erosion and flood protection measures in the lower Stehekin Valley.

(4) Manage Limited Funding. The NPS has spent more than $3 million to react to recent flood damage and new threats on an event-by-event basis to maintain vehicle access on the Stehekin Valley and Company Creek roads. A comprehensive and integrated set of strategies and tactics to meet the goals of the GMP and to mitigate the risk and impacts from flooding is urgently needed to enable the NPS to use limited funds for the maximum benefit of Lake Chelan NRA. Without this comprehensive approach, the NPS would continue to respond on a case-by-case basis, which costs more and could threaten natural resources and public safety.

(5) Respond to Private Land-Related Concerns. Lake Chelan NRA includes approximately 417 acres of private land, much of which lies within the floodplain and channel migration zone of the Stehekin River. Developments at McGregor Meadows and near the river mouth are particularly vulnerable because of their density and their location in more active river reaches. These sections of the river have extensive new gravel deposits and rapidly growing logjams as a result of recent floods. The high monetary and environmental costs of bank-protection and flood-mitigation measures continue to threaten long-term sustainability of recreation area resources and private property. At the river mouth, the accumulation of logs in the backwater zone of Lake Chelan has led to deeper floodwater in parts of the floodplain. The recent flooding has hastened channel migration, damaged or destroyed several cabins, incorporated debris and effluent from septic systems into the river, and increased the flood risk to private lands previously not threatened by flooding. The NPS is concerned that these circumstances will continue to adversely affect Lake Chelan NRA and Stehekin River natural resources and values. The primary means by which the NPS can address this concern is through a land exchange/acquisition program (Land Protection Plan (LPP)). The *Lake Chelan National Recreation Area Land Protection Plan* (NPS 1995b) identifies and prioritizes private lands for acquisition or exchange from willing sellers. Last updated in 1995, this plan is being revised through this DEIS to address new river-channel and floodplain conditions and to create new

funding opportunities to help protect Lake Chelan NRA and the Stehekin Community. In conjunction with this implementation plan, the Land Protection Plan has been revised to reflect the new river channel and flood conditions along the Stehekin River and new criteria for prioritizing land acquisition have been developed in response to these conditions. The revised Land Protection Plan is incorporated into Alternatives 2 - 4 in this DEIS and can be found in Appendix 13 (detached).

Photo 2 – Rafters on the Stehekin River

DECISION TO BE MADE

NEPA requires the documentation and evaluation of potential impacts resulting from federal actions on lands under federal jurisdiction. An EIS discloses the potential environmental consequences of implementing the proposed action and other reasonable and feasible alternatives. NEPA is intended to provide decision makers with sound knowledge of the environmental consequences of the alternatives (or parts thereof) available to them. In this case, the superintendent of Lake Chelan NRA (North Cascades National Park Service Complex) and the Pacific West Regional Director are faced with deciding which alternative to implement from the SRCIP to most effectively implement the 1995 GMP, to sustainably operate and maintain Lake Chelan NRA administrative and visitor facilities, and the private Stehekin Community and the visitor services it provides.

Background

This SRCIP is a response to the effects of the increased frequency and magnitude of flooding on the Stehekin River and the adverse effects this flooding has had on NPS infrastructure and private lands in the lower Stehekin Valley.

The following key characteristics of the Stehekin Valley require careful planning to avoid the effects of repeated flood damage:

- The flood prone nature of the Stehekin River, which is due to its geography, watershed shape, and steep slopes (includes the potential for the formation and sudden failure of debris dams in the narrow canyons above High Bridge)
- Channel instability from the transport of large amounts of gravel, water, and large wood
- A shift in the last 30 years from spring floods to larger, more frequent, fall floods
- A history of river manipulation, including the Lake Chelan Dam, and the addition of erosion protection measures to the river over the last 20 years—riparian resources and water quality have been adversely affected as destroyed cabins, effluent from septic systems, and other debris are incorporated into the river during floods

SUMMARY: MANAGEMENT ALTERNATIVES

The following description summarizes the differences among the management alternatives. A detailed comparison of the alternatives is found in Chapter II: Management Alternatives and in Table II-1: *Alternative Comparison Chart*. Illustrations of the alternatives are found in Figures ii-4 through ii-10.

- Alternative 1: No Action (Continue Current Management Practices and Existing Plan Implementation)
- Alternative 2: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; More High-Priority Land Acquisition in the Channel Migration Zone (Preferred)
- Alternative 3: At-Risk Public Facilities Removed from Channel Migration Zone in Most Areas; Same Land Acquisition as in Alternative 2
- Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less High-Priority Land Acquisition in Channel Migration Zone.

Introduction

Alternatives 2 - 4 embrace the concept of floodplain utilization to varying degrees. In this concept, floodwaters would be allowed to spread out across the floodplain, rather than being constrained by dikes or levees. Floodplain utilization is proposed to reduce flood damage in any one area during the largest events.

All of the action alternatives also identify integrated actions that are sustainable. Past integrated actions undertaken by the NPS include private-public partnerships to maintain floodplain utilization in McGregor Meadows (1998), the “1948” channel (2007), and upper Company Creek Road (2007). In this plan, integrated solutions to erosion and floodplain utilization include the proposed actions at Boulder Creek, the Stehekin River Mouth, and using the Land Protection Plan revision to ease threats to private property and the integrity of the Stehekin River.

On public land, Alternatives 2 - 4 attempt to avoid the channel migration zone, rather than just the 100-year floodplain. This more conservative approach is used because of the observed rapid changes in Stehekin floodplain boundaries during large floods; the high cost of computer models to determine flood elevations to map accurate floodplain boundaries; and the inaccuracy of these models.

The alternatives conform to recreation area policies in the Lake Chelan GMP, which call for removing public and administrative facilities from the floodplain. Options for private development in the floodplain include exchange of land with the NPS, purchase of private property out of the floodplain, elevating cabins, or construction of a variety of physical features to reduce the impacts of flooding (see Appendix 7: Army Corps of Engineers (ACOE) Advanced Flood Protection Measures). Other alternatives, such as construction of additional levees or dikes or dredging, were considered but were dismissed because they would have unacceptable impacts on the Stehekin River floodplain, would result in more ecological damage, or would require repeated, costly management actions (see "Alternatives and Actions Considered but Dismissed" below and in Chapter II).

Because all alternatives involve various treatments of the Stehekin Valley Road, for which the FHWA would provide the necessary funding, design, and construction expertise, the FHWA is participating as a cooperating agency in the development of this DEIS.

Summary of Actions Common to All Alternatives (1 - 4)

Several actions in this plan are common to all Alternatives (1 - 4) because they were identified in the GMP. These actions would also protect public facilities or support the concept of floodplain utilization (Figure ii-4: *Actions Common to All Alternatives*).

Actions called for by the 1995 Lake Chelan NRA GMP that would be implemented by all alternatives include replacement and relocation/construction of the NPS maintenance compound to the north end of the airstrip; replacement and relocation/construction of administrative housing in the same area; creation of a Lower Valley Trail that connects Stehekin Landing (Landing) to High Bridge and which is also connected to the Stehekin River Trail via a footbridge; and the ongoing use of willing seller-willing buyer land acquisition and exchange to remove development from the Stehekin River floodplain. Actions involving administrative and maintenance facilities will require additional site-specific environmental review and are not analyzed in detail in this document.

The Company Creek Road would be maintained in its existing alignment and existing erosion protection measures along the Stehekin Valley and Company Creek roads would be maintained, including the 400-foot-long levee constructed in the 1980s. The levee has virtually no effect on floodplain utilization because of its short length and location and is necessary to maintain the Company Creek Road in place as called for by the GMP.

The Stehekin Valley Road at Wilson Creek, Milepost 8.0, and Frog Island would be protected in place in all alternatives because these locations have severe erosion problems and no viable reroutes. Actions to protect these areas, however, would vary among the alternatives. Grade-control structures designed to maintain sheet flow in floodplains during large floods at Milepost 7.0 and 9.2 on the Stehekin Valley Road and along the upper Company Creek Road would also be maintained. These structures were installed by private-public partnerships in 1998 and 2008 and are consistent with the concept of floodplain utilization because they protect the road from being occupied by the river. Consistent with the current GMP, logjams could be manipulated on the Stehekin River to protect Harlequin Bridge and the roads.

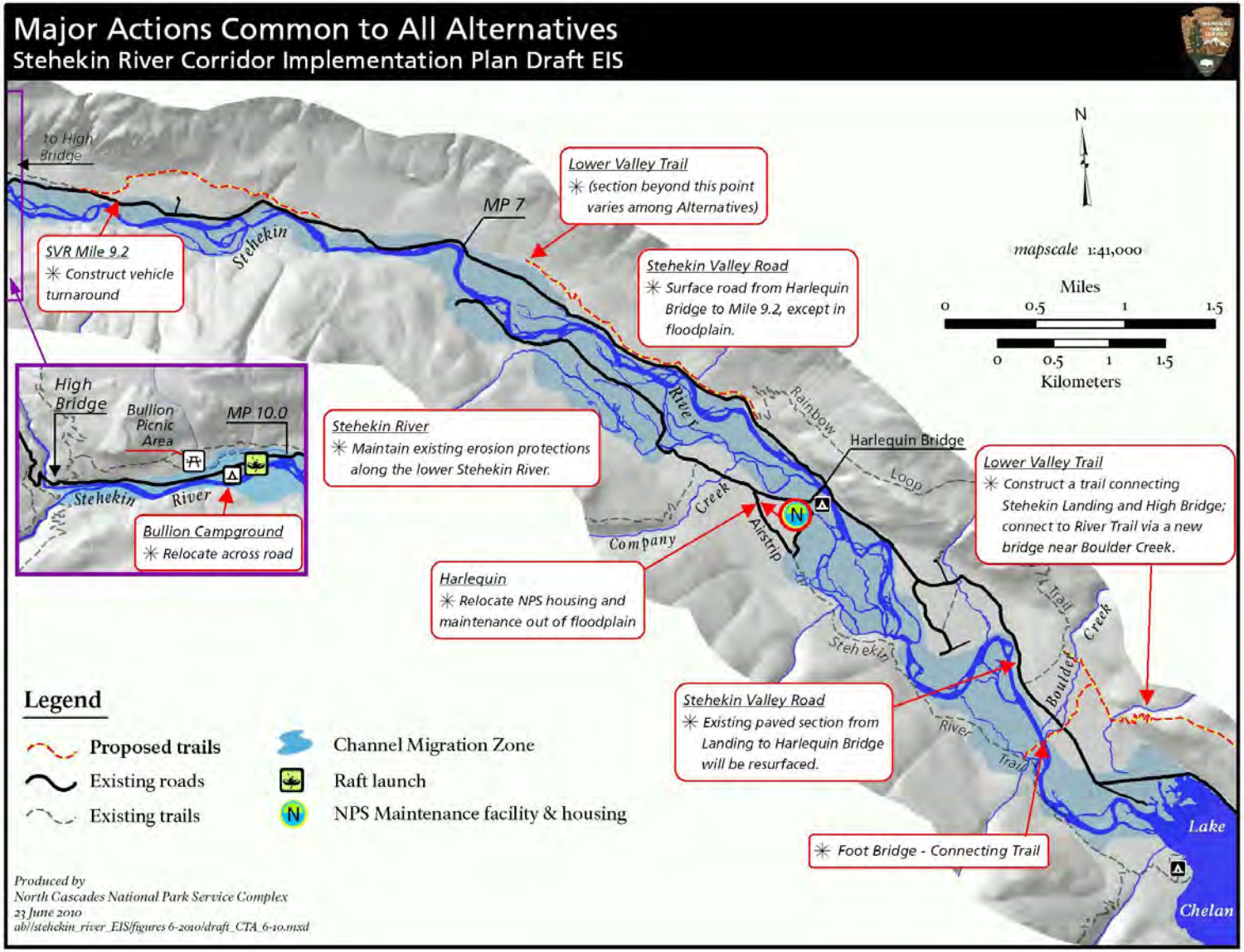

Figure ii-4: Actions Common to All Alternatives

Recreational Facilities: Bullion Camp would be relocated downstream and across the road to mitigate safety concerns associated with hazard trees in the current camp. Day use, however, would be retained at the former Bullion Camp.

Alternative 1: No Action (Continue Current Management Practices and Existing Plan Implementation)

This alternative would continue existing management practices and improvements called for by existing plans (Figure ii-5: *Major Actions Proposed in Alternative 1*). Foremost among these would be continuing implementation of the GMP, as described previously under "Actions Common to All Alternatives (1 - 4)" and the 1995 Land Protection Plan.

Photo 3 – Stehekin Valley Road in McGregor Meadows during the 2006 Flood

Implementation of the 1995 LPP would continue using existing criteria and potential exchange lands. Decisions regarding land acquisition priorities would continue to be based on properties identified based on currently out-of-date floodplain boundaries and protection of scenic resources (areas of high visual sensitivity) along the Stehekin Valley Road. Both the Stehekin Valley Road and the Company Creek Road would be retained in their existing alignments.

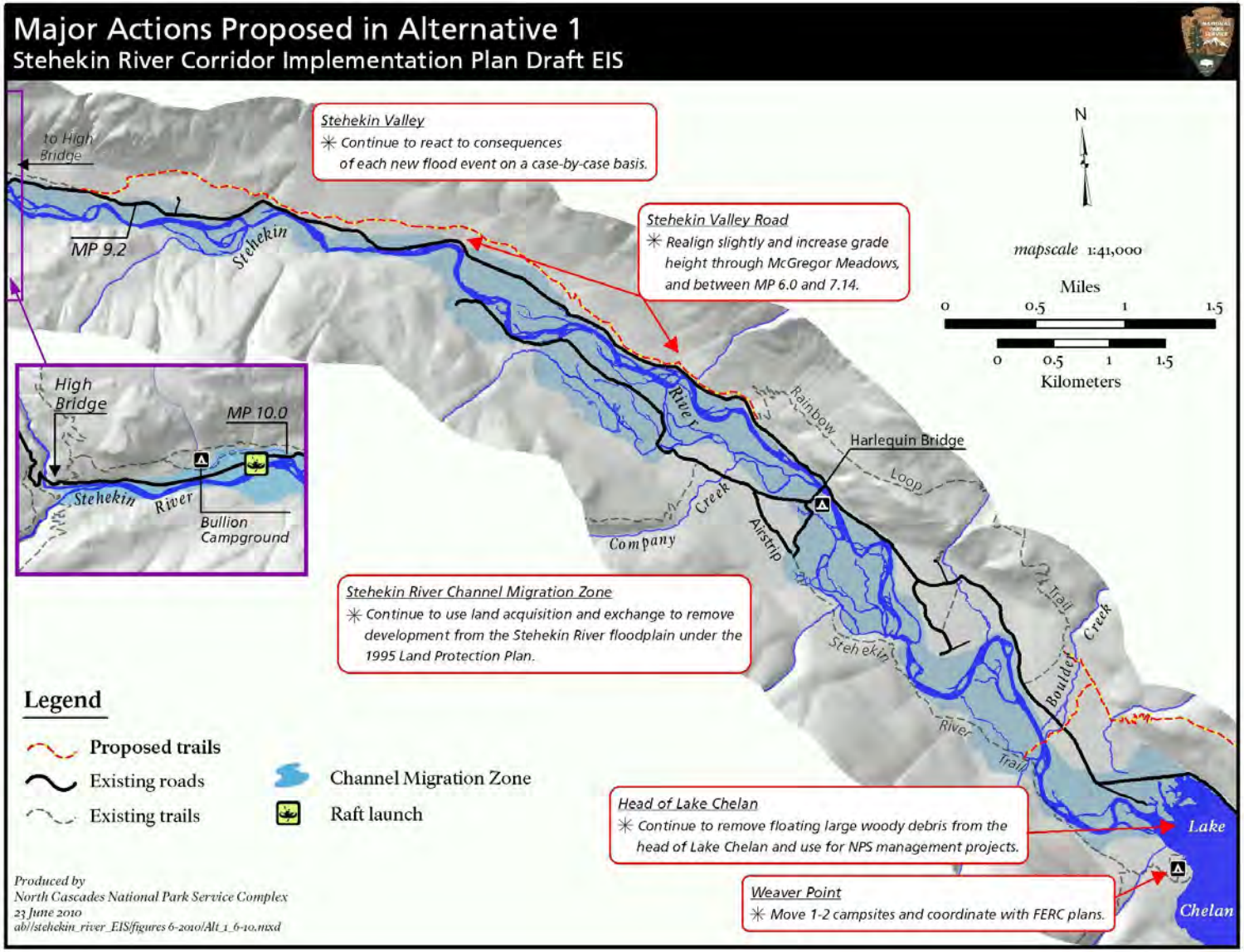

Figure ii-5: Major Actions Proposed in Alternative 1

Stehekin Valley Road Improvement Project actions for the Stehekin Valley Road would include rehabilitation and surfacing of the road with an asphalt chip seal for 4.9 miles from Harlequin Bridge to the winter turnaround (Milepost 9.2), except for areas within the floodplain. There would be slight realignment (between Mileposts 6.0 and 6.5) and two grade increases (from Milepost 6.25 to 6.53 and from Milepost 6.95 to 7.14) using nearly 5,600 cubic yards of fill through McGregor Meadows, as well as implementation of erosion protection measures at Wilson Creek (NPS 2005). To retain the road, Alternative 1 would also include maintenance of, but not major improvements to, existing erosion protection measures along the lower Stehekin River. Routine maintenance actions, including snow removal; spring opening; unpaved road grading, shaping, and repair; paved road asphalt patching; ditch clearing; culvert cleaning; vegetation maintenance; and sign replacement would also continue as needed. It is anticipated that existing pavement would be resurfaced during or shortly after road projects above Harlequin Bridge.

Photo 4 – Floor of NPS Maintenance Shop after 2003 Flood

In Alternative 1, unlike the other alternatives, the NPS would continue to react to the consequences of each new flood event on a case-by-case basis, producing individual environmental assessments as needed to implement management actions.

Floating large woody debris could continue to be removed from the head of Lake Chelan and used for NPS management projects. Individual pieces could also be turned or trimmed (subject to NPS approval) to maintain safe rafting in the Stehekin River, while logjams could only be removed to protect Harlequin Bridge and public roads.

Parts of the Stehekin Valley Road and Company Creek Road would continue to lie adjacent to and within the floodplain / channel migration zone of the Stehekin River. Over time, it is anticipated that this would continue to require the NPS to install additional erosion protection measures in the river (e.g., rock barbs) to protect roads and public facilities. There would continue to be limited improvements to visitor and administrative facilities within the lower Stehekin Valley to implement the GMP. In Alternative 1, rehabilitation of the Stehekin Valley Road would be implemented upon approval of this DEIS. Replacement and relocation of the maintenance facility and NPS housing (NPS Tracts 06-118, 06-104,

06-121, and 06-122) would be implemented following site specific environmental analysis and approval of a tiered environmental assessment.

In Alternative 1 as in other alternatives, private landowners could continue to implement the U.S. Army Corps of Engineers "Advanced Flood Protection Measures" (Appendix 7), including elevating cabins or constructing measures to protect private structures from the largest floods.

Recreational opportunities associated with the Stehekin River would continue, including camping, rafting, and hiking. As noted above, the Lower Valley Trail would be constructed to link the Landing with High Bridge, including connecting it to the Stehekin River Trail with a bridge near the mouth of Boulder Creek. In this alternative the trail would use 6.1 miles of existing trail and would require 6.3 miles of new trail to be constructed.

Elements Common to All Action Alternatives (2 - 4)

In addition to the actions that would be common to Alternatives 1 - 4, there are a variety of elements common to Alternatives 2 - 4, including proactive measures to protect administrative and public facilities from the future consequences of flooding.

Erosion Protection Measures: A logjam and new grade-control structure would be installed near Milepost 2.0 (Boulder Creek) to maintain sheet flow in the floodplain. Erosion protection measures would also be undertaken near the river mouth, Milepost 3.8 (Frog Island), Weaver Point, and Milepost 5.3 (Wilson Creek), though specific actions would vary by alternative.

The raveling slope at Milepost 8.0 would also be stabilized by laying back the uppermost part of the slope brow, which produces most of the large rocks that fall onto the road. A rock wall (100 - 150 feet long and 3 - 8 feet high) would also be added at the base of the slope.

Large woody debris could be manipulated within the Lake Chelan backwater zone (0.25 mile from the head of the lake up the Stehekin River) if it posed a threat to the Stehekin Valley Road or water quality. Under certain conditions, it could also be used for agency-permitted erosion protection measures.

In addition, because there is a large volume of wood now in the river system and because of the backwater influences of Lake Chelan, there is the potential for a large logjam to cause flooding of the densely developed area near the Bakery or to preclude access on the Stehekin Valley Road. Under these emergency conditions, large logjams in this area could be manipulated to remove the threat consistent with the GMP. As with other use of large woody debris, the wood taken from this area could only be used in the channel migration zone for erosion protection and/or restoration projects.

Restoration: Restoration of a 300-foot-long riparian strip along the Stehekin River at Buckner Homestead lower hayfield and pasture and along the Lower Field would occur, as would bioengineering (layered planting of native shrubs) associated with erosion protection measures.

Private Property Access: If access to private property was compromised by river encroachment, the NPS would work with private landowners on a case-by-case basis to evaluate alternative access.

Land Protection Plan: The NPS would make new exchange lands available through the revised Land Protection Plan (Figure ii-6: *Potential Exchange Lands in the 1995 and Revised Draft Land Protection Plan*).

Recreational Facilities: New individual camping would occur near Rainbow Falls and group camping would occur at the Purple Point Horse Camp.

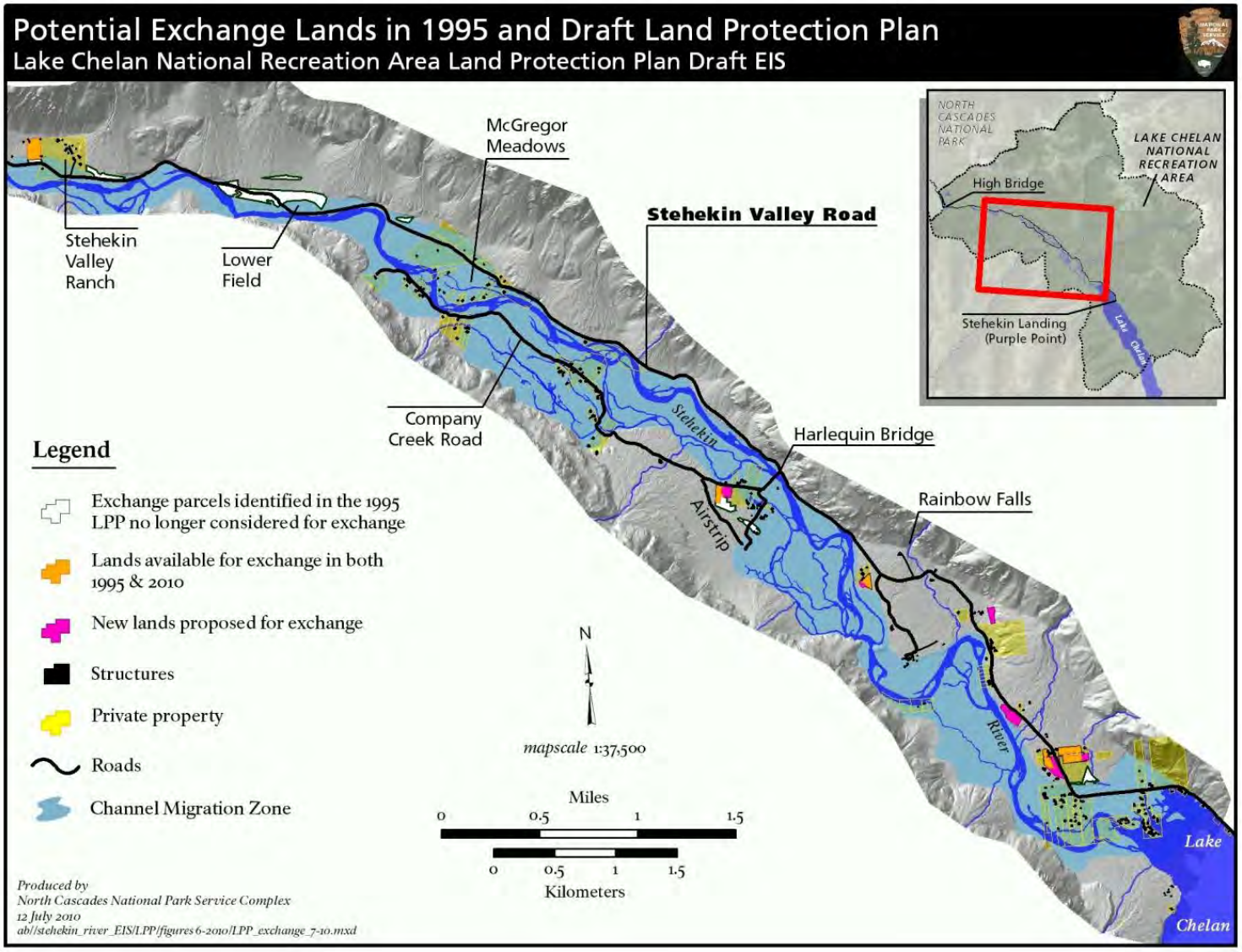

Figure ii-6: Potential Exchange Lands in the 1995 and Revised Draft Land Protection Plan

Alternative 2: At-Risk Public Facilities Removed from the Channel Migration Zone Where Possible; More High-Priority Land Acquisition/Exchange in the Channel Migration Zone (Preferred)

Compared to other alternatives, Alternative 2 would allow the Stehekin River the most space to utilize its floodplain and move within its natural channel migration zone over time (Figure ii-7: *Major Actions Proposed in Alternative 2*). Proposed new bank stabilization on the left bank would be installed at three new sites to protect the road, including the Stehekin River mouth, Milepost 3.8 (Frog Island), and Milepost 5.3 (Wilson Creek). At Mileposts 3.8 and 5.3 the river is at the edge of the channel migration zone, and relocation into steep cliffs is not feasible. As in other alternatives, Alternative 2 would also implement GMP provisions (including maintenance facility and housing relocation and construction of the Lower Valley Trail); however, there would be a change in the use of large woody debris to implement erosion protection measures. Alternative 2 would include limited use of wood from logjams in the river mouth area, where it is influenced by backwater from Lake Chelan. Such use would only be from the tops of prescreened jams, and only if the jam would not be destabilized.

The revised LPP would be used to encourage relocation of private property from within the floodplain / channel migration zone to outside the channel migration zone, using management actions such as land exchange or land acquisition from willing sellers. Land protection priorities would identify specific properties that are most threatened by the Stehekin River as it migrates across its channel migration zone. Where if development at these sites were claimed by the river, debris from cabins, wells, and septic systems, including effluent, would be incorporated into the river. The criteria in the LPP used to identify NPS lands for potential exchange has been weighted more toward removing private development from the floodplain in Alternatives 2 and 3 than in Alternative 4 (see Appendix 11 for the priority ranking of private lands in Alternatives 2 and 3). New exchange parcels outside the channel migration zone would be made available, while some lands available for exchange in the 1995 GMP would no longer be available due to new or changed conditions.

The Stehekin Valley Road would be rerouted from Milepost 5.7 to 7.5 (Figure ii-8). An access road would be maintained into McGregor Meadows from Milepost 5.7 to 6.5, to the last parcel of private property (07-157), until it is no longer needed. A turnaround at Milepost 6.5 to Milepost 6.8, would continue to provide administrative access to the grade-control structures. From Milepost 6.8 to 7.5, the road would be rehabilitated as part of the Lower Valley Trail. The portions of the Stehekin Valley Road before and after the reroute would also be rehabilitated and surfaced with an asphalt chip seal. Under Alternative 2, there would also be a series of erosion protection measures to stabilize those sections of the Stehekin Valley Road that are at the edge of the channel migration zone and cannot be relocated without major slope removal or extensive new road construction. Woody debris from the tops of some logjams and from floating logs in Lake Chelan could also be made available to landowners (for agency-permitted erosion protection) under a permit system. The wood could only be used in the channel migration zone for erosion protection and/or restoration projects. This action would limit importation of large rock and acknowledges the large amount of wood currently on the river. Rock barbs would be constructed at Wilson Creek (two to three barbs) and Frog Island (one to two barbs). Three more barbs and a small logjam would be located at a key point on the left bank above the river mouth. One or two of the barbs would replace 100 feet of rip-rap, and the bank would be revegetated with native shrubs. Another logjam would be constructed near Boulder Creek atop a grade-control structure (avulsion sill) away from the bank of the river and back into the forest. At Weaver Point, bank stabilization would be coordinated with plans under development by Chelan PUD for recreation, erosion, and cultural resource management. Riparian restoration and/or bioengineering would enhance riparian vegetation along the bank, at the Lower Field, Buckner Homestead hayfield and pasture, Wilson Creek, Frog Island, and the river mouth.

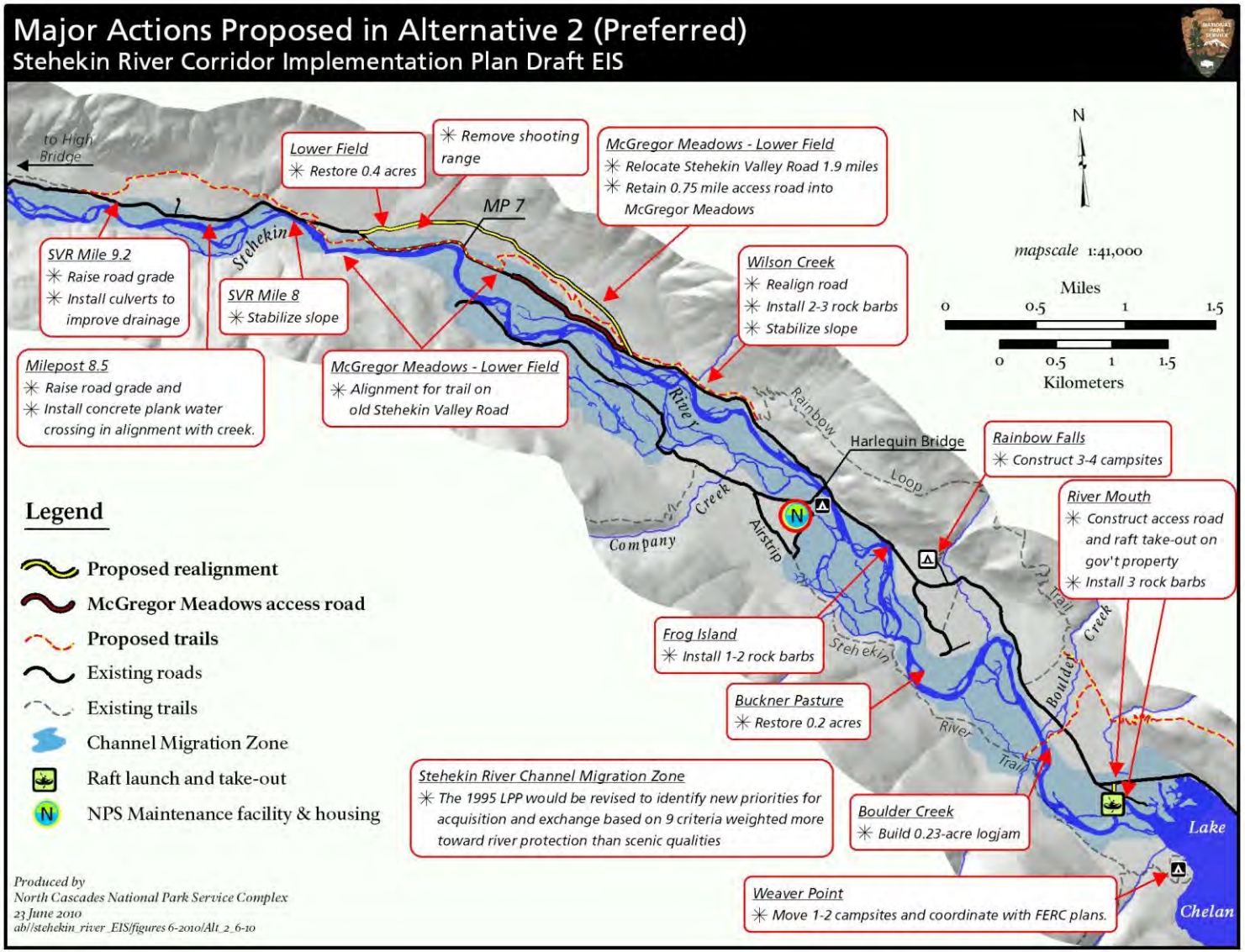

Figure ii-7: Major Actions Proposed in Alternative 2

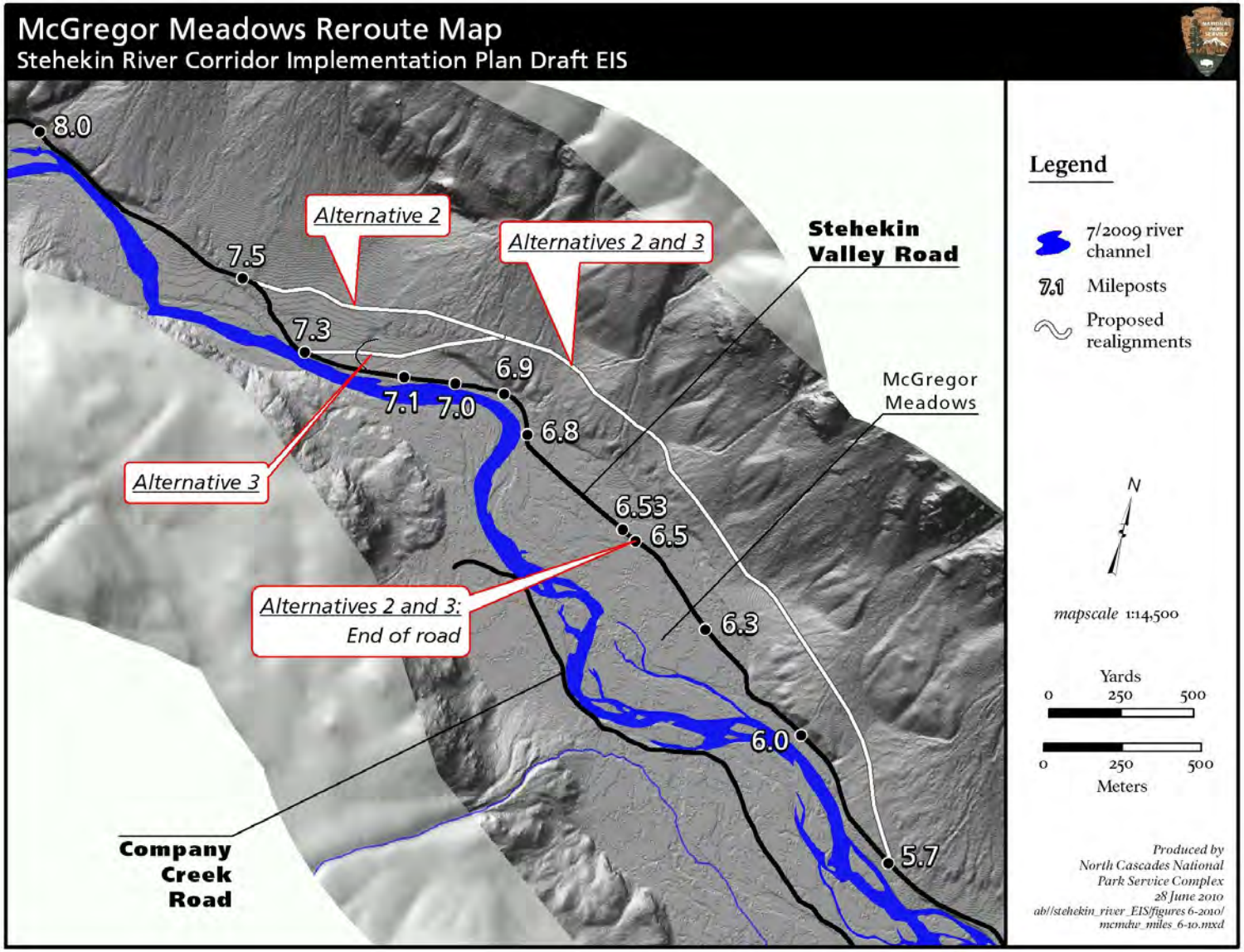

Figure ii-8: McGregor Meadows Reroute Map

Compared to Alternative 1, Alternatives 2 - 4 would involve some manipulation of woody debris within the Lake Chelan backwater zone (extending 0.25 mile from the head of the lake up the Stehekin River). In this area of the lower Stehekin River and Harlequin Bridge, large logjams that threatened public roads, water quality, public safety, and regular access to private property could be altered to relieve threats.

Recreational opportunities, including camping, rafting, and hiking associated with the Stehekin River would be enhanced. As in Alternative 1, the Lower Valley Trail would be constructed to link the Landing with High Bridge, including connecting it to the Stehekin River Trail. In this alternative (as in Alternative 3), fewer miles of new trail (4.6 miles) would be needed since the trail would use some former roadway (1.7 miles) and existing trail (6.2 miles). New group camping opportunities would be located at Purple Point Horse Camp to replace the group campsite at Harlequin when it is seasonally flooded. Three or four new individual sites would also be located near Rainbow Falls. In addition, a new raft takeout would be provided near the Stehekin River mouth, which would require a small new parking area and a 300-foot-long access road off of the Stehekin Valley Road. Because the shooting range is located along the proposed Lower Field reroute, it would be closed and restored. No replacement shooting range would be constructed.

Alternative 3: At-Risk Public Facilities Removed from Channel Migration Zone in Most Areas; Same Land Acquisition/Exchange as in Alternative 2.

Alternative 3 would allow the Stehekin River slightly less room to move within its natural channel migration zone and therefore would include the use of different erosion protection measures than in Alternative 2 (with four barbs and five logjams, instead of six to eight barbs and two logjams) (Figure ii-9: *Major Actions Proposed in Alternative 3*). As in other alternatives, Alternative 3 would implement the GMP replacement and relocation of the maintenance facility and housing areas and construction of the Lower Valley Trail. Different erosion protection approaches were developed since the rock barbs and logjams have different benefits and installation impacts. The erosion protection measures increase from Alternative 2 through Alternatives 3 and 4, consistent with the overall degree to which each alternative constrains the river. As in Alternative 2, there would be a minor change regarding the use of woody debris, and the revised LPP would be used.

The reroute of the Stehekin Valley Road in Alternative 3 would be slightly shorter than the one proposed in Alternative 2. The reroute would begin at Milepost 5.7 and would end at Milepost 7.3 (Figure ii-8). With the shortening of the reroute, the portion of the existing road that borders Lower Field would be stabilized with riparian vegetation and rock barbs. As in Alternative 2, an access road from Milepost 5.7 to Milepost 6.5 would be retained up to the last private parcel in McGregor Meadows until it is no longer needed; and administrative access would also be maintained to Milepost 6.8 for maintenance of grade-control structures. From Milepost 6.8 to Milepost 7.3, the road would be rehabilitated as part of the Lower Valley Trail.

Four rock barbs would be constructed along the bank at Weaver Point (two barbs) and Lower Field (two barbs), while large logjams would be constructed at Weaver Point, near the Stehekin River mouth, at Boulder Creek (and avulsion sill), at Frog Island, and at Wilson Creek. Restoration and/or bioengineering (layered planting using native shrubs) would also occur in the same locations as in Alternative 2.

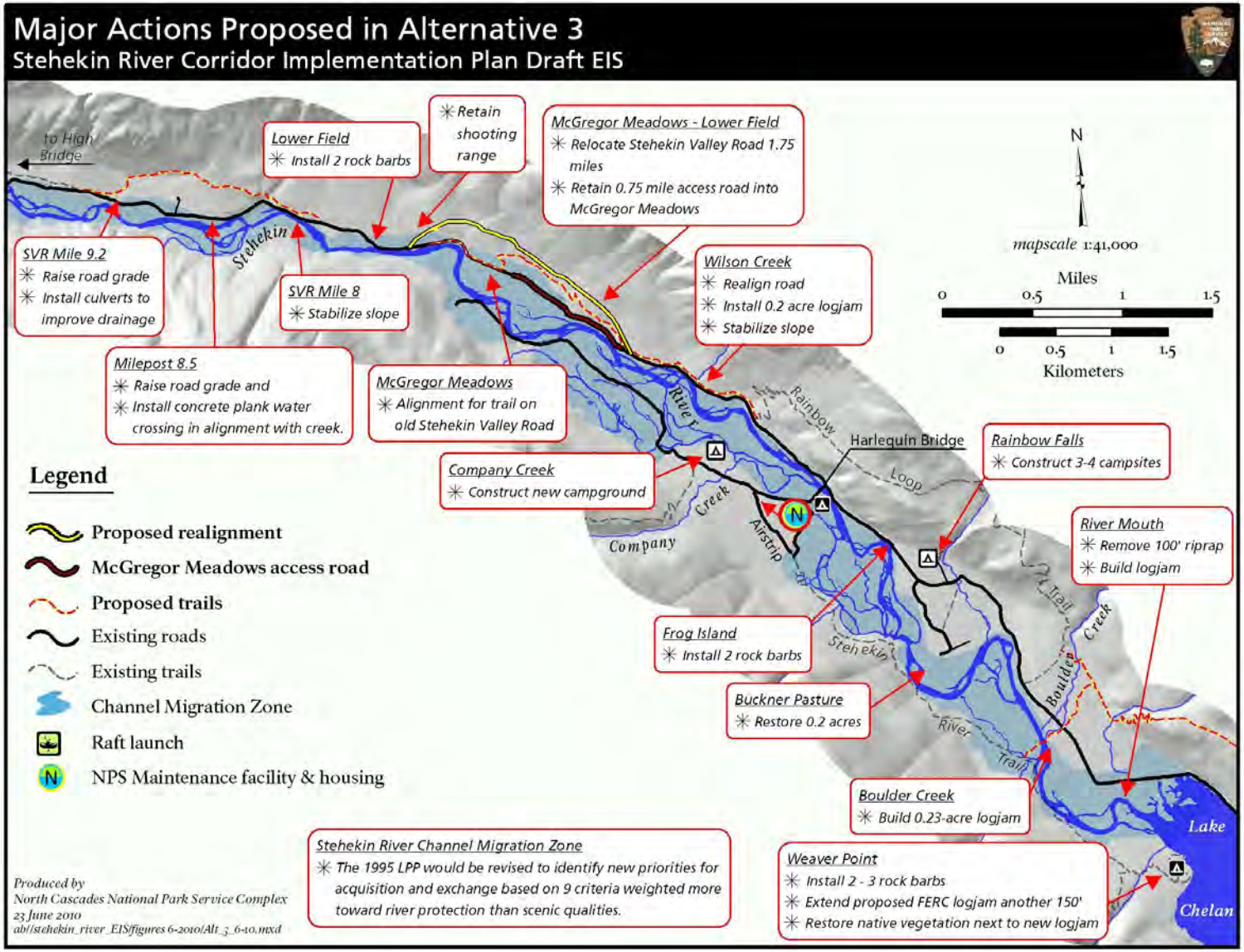

Figure ii-9: Major Actions Proposed in Alternative 3

Management of woody debris would be the same as in Alternative 2. Recreational improvements would be similar to Alternative 2; however, additional camping opportunities would also be provided at Company Creek at a previously disturbed site outside the Stehekin River channel migration zone, and no new raft takeout would be constructed near the Stehekin River mouth.

Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less High-Priority Land Acquisition in Channel Migration Zone

Compared to Alternative 1, Alternative 4 would allow for some additional movement of the Stehekin River within its channel migration zone, if private property was purchased or exchanged. If Alternative 4 was selected, the draft LPP (Appendix 13) would be revised to rank high priority lands per the criteria shown in Table II-15. Alternative 4 would constrain the movement of the Stehekin River from a large part of its floodplain through McGregor Meadows and at Lower Field (Figure ii-10: *Major Actions Proposed in Alternative 4*). Appendix 11 lists the priority ranking of private lands for Alternatives 2 and 3; Appendix 12 lists the priority ranking of private lands for Alternative 4. The LPP revision is different than in Alternatives 2 and 3. Land exchanges would be focused less on properties along the river, and more on sustaining the current development pattern. Because of this, there would be fewer parcels with a high priority for acquisition that would allow for their removal from the channel migration zone. Some private development in flood-prone areas near the river channel, however, would be considered for exchange or purchase. Actions associated with GMP implementation (including replacement and relocation of the maintenance facility and NPS housing and construction of the Lower Valley Trail) would be the same as in "Actions Common to All Alternatives (1 - 4)."

As in Alternatives 2 and 3, there would be stabilization and riparian restoration of the bank along the Lower Field. As in Alternative 1, instead of a reroute around McGregor Meadows, Stehekin Valley Road would be raised in some locations to minimize flood damage, and 4.9 miles of the road would be rehabilitated and paved between Harlequin Bridge and the winter turnaround.

There would be additional placement of barbs and bioengineering for erosion protection measures implemented along the Stehekin River, not only at the Lower Field, but also near Milepost 7.0 and Milepost 9.2. To maintain the Stehekin Valley Road in its existing alignment, Alternative 4 would have the greatest number of locations where erosion protection measures would be undertaken. Rock barbs would be constructed at Weaver Point (two barbs), Stehekin River mouth (three barbs), Frog Island (two barbs), Wilson Creek (two to three barbs), Lower Field (two barbs), Milepost 7.0 (two barbs), and Milepost 9.2 (three barbs), and a large logjam/avulsion sill would be constructed at Boulder Creek along the bank extending into the forest. Riparian restoration and/or bioengineering (layered planting associated with rock barbs or logjams) would also occur in the same locations as in Alternatives 2 and 3.

Use of woody debris would be the same as in Alternatives 2 and 3 (with both NPS and private, permitted use), except that woody debris could be used from the tops of prescreened logjams from areas below the Bullion raft launch, including at McGregor Meadows. (This is in contrast to Alternatives 2 and 3, which restrict taking logs from the river to below Boulder Creek in the Lake Chelan backwater zone.)

Recreational improvements would be the same as in Alternative 3 except there would be a raft launch in this alternative, as in Alternative 2. Construction of the Lower Valley Trail would be similar to that proposed in Alternative 1, with 6.1 miles of existing trail and 6.3 miles of new trail, but it would follow more sections of the existing road under this alternative.

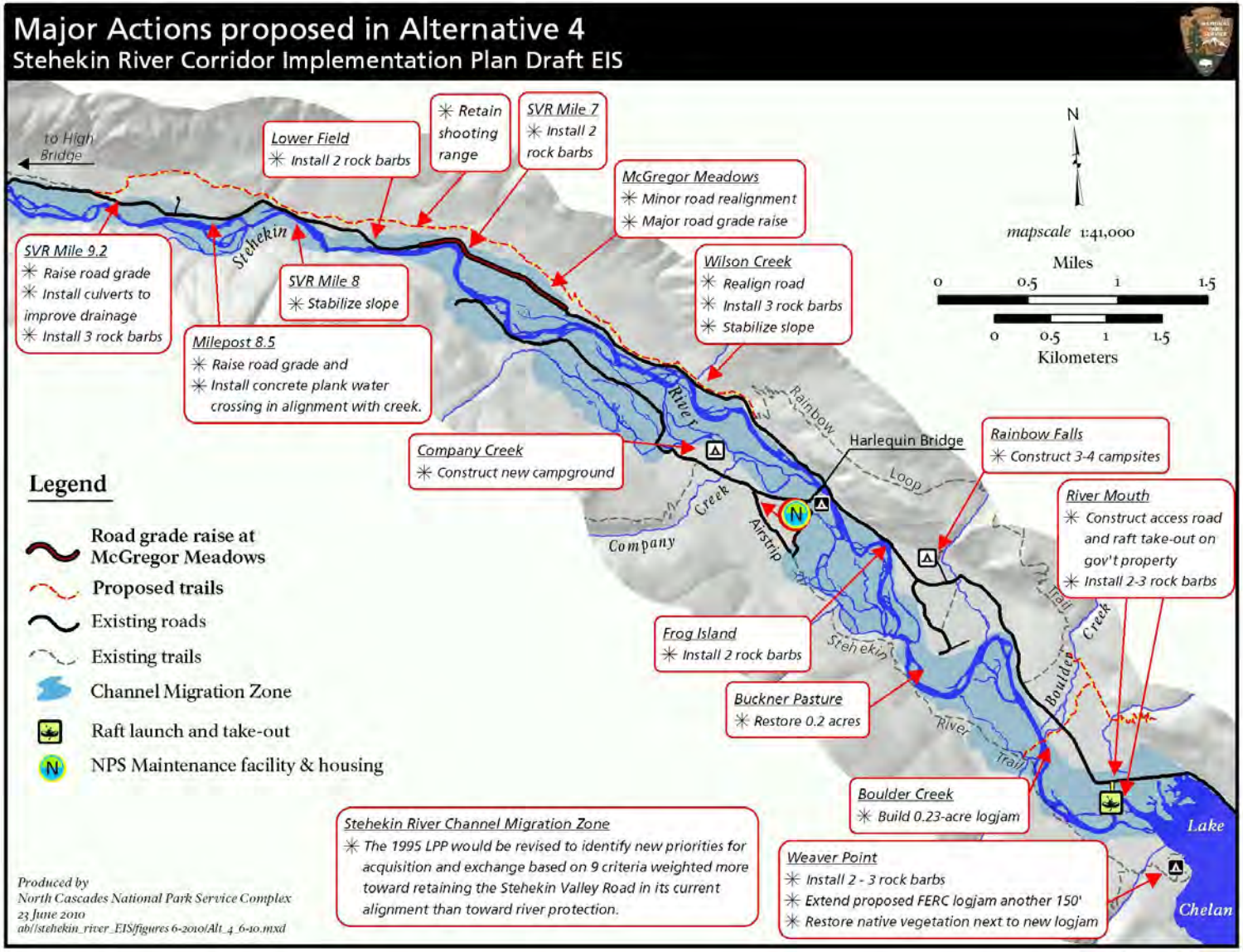

Figure ii-10: Major Actions Proposed in Alternative 4

LIST OF ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED

Under NEPA,(40 CFR 1504.14 (a)) alternatives may be eliminated from detailed study based on the following reasons:

- Technical or economic infeasibility;
- Inability to meet project objectives or resolve need for the project;
- Duplication of other less environmentally damaging alternatives;
- Conflicts with an up-to-date valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement; and
- Environmental impacts too great, in either a cumulative or site-specific sense.

The following alternatives or variations were considered during the design phase of the project, but because they met one or more of the above criteria, they were rejected. Information about why these alternatives or actions were rejected is included in Chapter II (D: Alternatives and Actions Considered but Dismissed) of this document:

- Allow use of the airstrip for exchange to relocate private property outside of the floodplain.
- Implement additional flood protection (bank hardening) measures, such as rip-rap or levees along the banks of the Stehekin River to prevent flooding.
- Implement additional erosion protection measures at Buckner Homestead hayfield and pasture
- Exchange lands to allow private landowners to establish or maintain flood/erosion protection.
- Take action as part of the plan to solely protect private property.
- Reroute the Road at Milepost 8.0.
- Reestablish the south side Stehekin Valley Road along the Company Creek Road alignment, including constructing a new bridge.
- The scope of the plan should include the entire Stehekin River Watershed, including the area above High Bridge.
- Sediment and large woody debris sources above High Bridge and/or in the whole Stehekin watershed should be evaluated for treatment.
- The Stehekin River should be contained within a channel to reduce flooding of private property and public facilities.
- The plan should include actions that would resolve issues in the whole lower valley.
- The goal of the plan should be to allow natural processes to occur unimpeded so that natural flooding and erosion can continue to occur without regard to its effect on facilities and private property.
- Plan alternatives should include consideration of rerouting the Company Creek Road.
- Excess materials, including large woody debris and excavated gravel generated by the plan should be used for other public and private projects in Stehekin.
- Use suitable gravel from Stehekin for projects in the valley instead of importing materials at high cost.

- Pile burning or consumptive use of large woody debris generated by the plan should be considered.
- The plan should consider changes to the *Sand, Rock and Gravel Plan* to allow use of gravel generated by plan actions.
- Gravel removal should be used instead of land exchanges.
- Dredging should be part of the plan as long as it is done in a way that minimizes impacts.
- Reroute the Road at Milepost 9.2.
- Relocate the shooting range in Alternative 2.

Interdisciplinary Analysis / Technical Committee

Analysis of impacts to wildlife, plants, and cultural resources was conducted primarily by NPS staff. The U.S. Fish and Wildlife Service was consulted on impacts to threatened and endangered species, including the northern spotted owl. In addition, because of the large amount of hydrologic and geologic data on the Stehekin River; the complexity of the Stehekin River system; and the number of issues, sites, and actions considered in this plan, the NPS established a technical committee for this planning effort. The committee included representatives from Chelan County, Chelan PUD, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Washington Departments of Ecology and Fish and Wildlife, and Geomax PC, a private consulting engineer familiar with Stehekin. The technical committee provided scientific and regulatory information related to long-term river and floodplain management in the lower Stehekin Valley.

Photo 5 – Harlequin Bridge

To comply with the Federal Advisory Committee Act (1972), the purpose of the technical committee was not to advise the NPS on plan development, but rather to assess technical information and the applicability of regulations regarding proposed management alternatives and actions. Meetings of the technical committee were held to identify issues and to review alternative development in spring 2008; to conduct a field review of potential actions and sites in summer 2008; and to analyze impacts associated with specific alternative actions.

SUMMARY OF ISSUES AND IMPACT TOPICS CONSIDERED

Impacts of each alternative have been analyzed. The impact topics focus the discussion of impacts on the comparison of affected resources.

The following impact topics have been retained because measurable impacts would occur from implementation of the alternatives and because concerns about impacts were expressed by the public and/or the interdisciplinary team. A detailed analysis of their inclusion is given in Chapter I*:* Purpose of and Need for Management Action.

- Land use
- Air quality
- Soils and vegetation
- Water resources (including hydraulics and streamflow characteristics, water quality, wetlands, and floodplains)
- Geologic hazards
- Wildlife
- Special status wildlife
- Prehistoric and historic archeological resources
- Historic structures
- Visitor experience (including access and transportation, visitor use opportunities, interpretation and education, scenic resources, and safety)
- Wild and scenic rivers
- Park operations
- Socioeconomics
- Hazardous materials
- Unavoidable adverse impacts
- Relationship between short-term use of the environment and maintenance and enhancement of long-term productivity
- Irreversible and irretrievable commitments of resources

The topics listed below either would not be affected or would be affected only negligibly by the alternatives evaluated in this DEIS. Therefore, these topics have been dismissed from further analysis. A detailed rationale for dismissing these and other impact topics is given in Chapter I: Purpose of and Need for Management Action.

- Water quantity
- Special status plants
- Traditional cultural (ethnographic) resources
- Museum collections
- American Indian Religious Freedom Act
- Lightscapes
- Wilderness
- Soundscapes
- Prime and unique farmlands
- Energy consumption (carbon footprint of alternatives is discussed in Air Quality)
- Environmental justice.

IMPACT ASSUMPTIONS

Acreage impacts and other quantified impacts provided within the analysis are preliminary. This information is provided to convey the relative differences in impacts among alternatives and is from multiple sources, including the 30 percent road designs provided by Federal Highway Administration (FHWA) to the North Cascades National Park Service Complex. Final impact numbers would likely be within 10 percent of the numbers provided in Table ii-1: Impact Assumptions and throughout this document. Estimated road impacts have been rounded to the nearest half or whole acre, although some specific differences are given within, depending on the impact being discussed. Impacts associated with erosion protection measures and recreational features have been derived from designs based on the anticipated area that would be affected. Implementation of these measures would have similar impacts but could be slightly more or less than the approximate impact figures identified.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

NEPA requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. These analyses provide the basis for comparing the effects of the alternatives. NEPA requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to mitigate impacts. In addition to determining the environmental consequences of the preferred and other alternatives, NPS *Management Policies 2006* (NPS 2006a) and Director's Order 12 (NPS 2001a) require analysis of potential effects to determine if actions would impair park resources.

Below is a summary of major adverse and beneficial impacts that would occur under the alternatives (Table ii-1: *Impact Assumptions*). These impacts are further defined in Chapter IV of the DEIS. In Table IV-16: *Impact Comparison Chart*, in addition to major impacts, negligible, minor, and moderate impacts are described. For each impact topic, effects of the alternatives are assessed by context, type, duration, area, and intensity, and include a discussion of cumulative impacts.

Table ii-1: Impact Assumptions

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Overall road mileage	4.9 mi	Same as Alt 1	Same as Alt 1	Same as Alt 1
Actual area (road length × 16 ft)	9.4 ac	Same as Alt 1	Same as Alt 1	Same as Alt 1
Estimated lands available for exchange	37 ac	24 ac	Same as Alt 2	Same as Alt 2
Site-specific road improvements (pullouts, winter turnaround)	0.8 ac	0.9 ac	0.9 ac	Same as Alt 1
McGregor Meadows Access Road	N/A	1.3 ac (0.8 mi)	Same as alt 2	N/A
Number of barbs (acres)	0	6 - 8 (0.5)	4 (0.3)	16 - 17 (1.1)
Number of logjams (acres)	0	2 (0.1)	5 (0.3)	3 (0.1)
Maintenance / housing relocation	5 - 8 ac	Same as Alt 1	Same as Alt 1	Same as Alt 1
Recreational improvements	3.1 ac	3.6 ac	3.4 ac	3.5 ac
Restoration				
a. Riparian b. Upland c. Bioengineering (barbs and logjams)	1.5 ac 3.6 ac n/a	4.1 ac 4.4 ac 0.6 ac	3.9 ac 3.7 ac 0.6 ac	2.9 ac 3.7 ac 1.2 ac
Total restoration (a+b+c)	5.1 ac	9.1 ac	8.2 ac	7.8 ac
Total disturbance	10 ac (new) 37 ac (LPP) 12 ac (existing)	28 ac (new) 24 ac (LPP) 8 ac (existing)	28 ac (new) 24 ac (LPP) 9 ac (existing)	11 ac (new) 24 ac (LPP) 12 ac (existing)

Alternatives 2 and 3 have major benefits in eight impact categories, while major negative impacts occur in five categories. Benefits in Alternative 2 would occur in land use, soils and vegetation, hydraulics and streamflow, water quality, wetlands, floodplains, NPS operations, and hazardous materials impact categories. Most of these beneficial impacts are from removal of the NPS maintenance facility and housing and 1.9 miles of road from the floodplain in McGregor Meadows and the Lower Field. An updated Land Protection Plan in Alternatives 2 and 3 would create opportunities for private landowners and the NPS to remove some of the most threatened floodplain development. As shown in Figure ii-11, Alternatives 1 and 4 have fewer major beneficial effects than Alternatives 2 and 3.

Most of the major negative impacts in Alternatives 2 and 3 are associated with short- and long-term disturbances to land use, vegetation and soils, water quality, and wildlife during construction of the new road around McGregor Meadows and NPS facilities. The reroute includes the possibility of disturbing a nesting site for northern spotted owls. Alternatives 1 and 4 avoid immediate encroachment on the owl activity area, but over the long term, anticipated channel avulsion in the valley near the nesting site would require additional activity to protect the road and could disturb the owls.

All of the action alternatives would add to cumulative effects on the Stehekin River by installation of new erosion protection structures. Alternative 2 would add six to eight rock barbs at three sites, an increase in

the total number of barbs on the river from the current 30, and an increase in affected streambank from 6.5 to 8.3%. At Frog Island and Wilson Creek, the road is currently at the edge of its channel migration zone, and the added barbs would be viewed as a moderate impact. Proposed barbs at the Stehekin River mouth are along a terrace in the middle of the channel migration zone, and therefore have a larger impact than at the other two sites. At Frog Island and the Stehekin River mouth, impacts are mitigated to some degree because rock barbs and bioengineering would replace existing rip-rap.

Alternatives 2 and 3 would have similar cumulative impacts on river processes, but in Alternative 3 large engineered log jams would be installed instead of some rock barbs. By focusing on maintaining the Stehekin Valley Road in place, Alternative 4 would add to cumulative impacts to the river by adding 16 - 17 new rock barbs, increasing the amount of affected streambank from 6.5 to 9.5%. While Alternative 1 proposes the fewest new erosion protection structures, it would add more fill to the floodplain at McGregor Meadows to elevate the road, and would restrict the river from more of its floodplain, similar to Alternative 4.

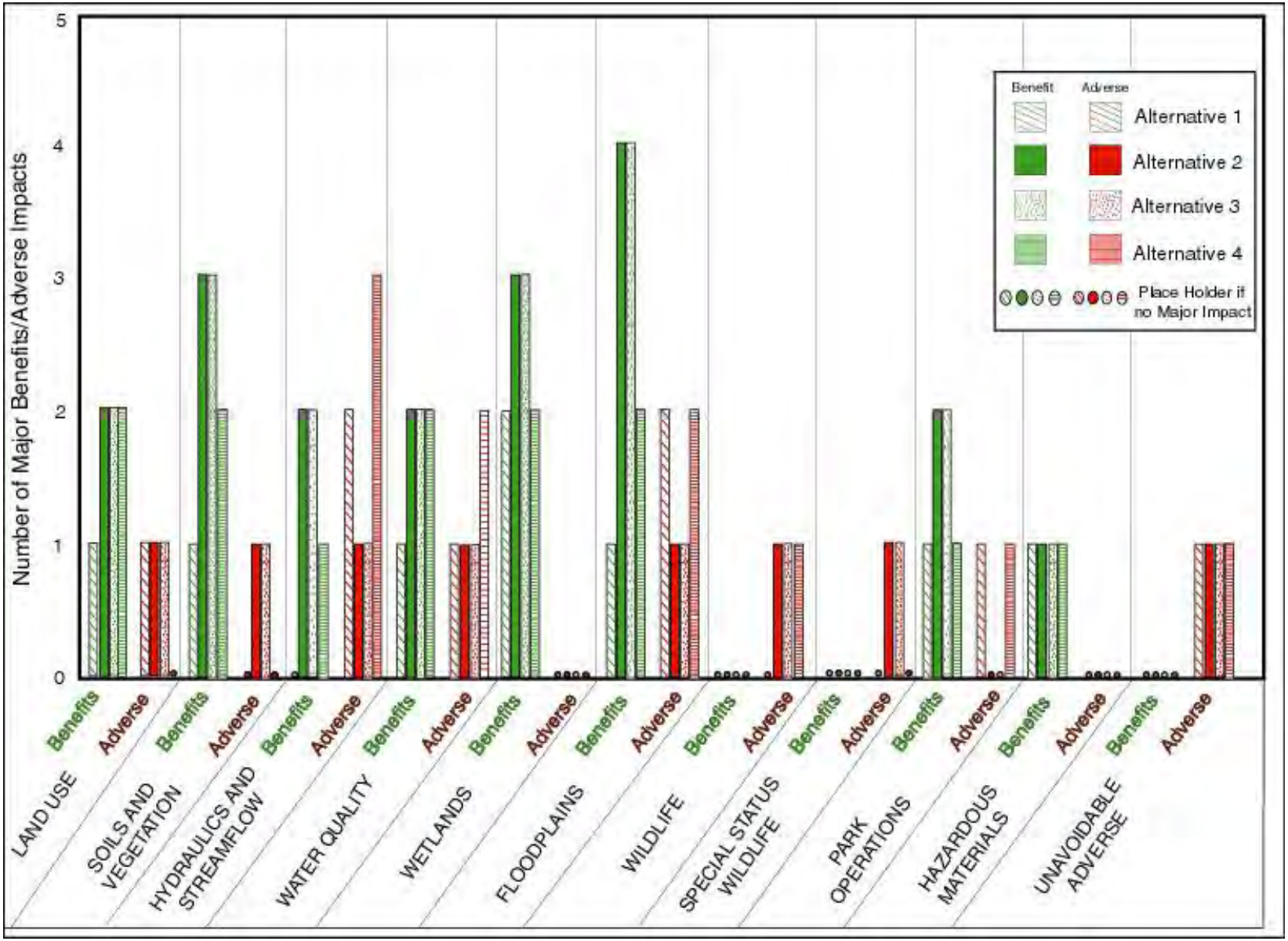

Figure ii-11: Impact Categories that Contain Major Benefits or Major Adverse Impacts