National Park Service
U.S. Department of the Interior

Lake Chelan National Recreation Area

Executive Summary

Stehekin River Corridor Implementation Plan and Final Environmental Impact Statement

North Cascades National Park Service Complex
Lake Chelan National Recreation Area
July 2012

Early Morning on Lake Chelan (John Chao).

Lake Chelan National Recreation Area

Stehekin River Corridor Implementation Plan and Final Environmental Impact Statement • Executive Summary

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Cooperating Agency:
Federal Highway Administration, U.S. Department of Transportation

Destruction of private cabin and damage to upper Company Creek Road during the 2003 flood.

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Final Environmental Impact Statement

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ABSTRACT

Because of the current impacts and future risks associated with unprecedented flooding and channel changes on the lower Stehekin River within Lake Chelan National Recreation Area (NRA), the primary purposes of the alternatives are to: sustainably operate and maintain National Park Service (NPS) administrative facilities, public access (roads and trails), and campgrounds; protect water quality, scenic values, habitat, and natural processes of the Stehekin River; and to partner with the Stehekin Community to provide services, facilities and experiences for visitors. This plan would enable the NPS to meet the goals and direction provided in the 1995 Lake Chelan NRA General Management Plan (GMP).

This implementation plan is needed to address the following interrelated issues: (1) respond to the increased magnitude and frequency of flooding, (2) implement and clarify 1995GMP guidance, (3) sustain public facilities while protecting natural resources, (4) manage limited funding, and (5) respond to private landowners.

Alternative 1 (No Action): Continue Current Management Practices and Existing Plan Implementation: Maintain the Stehekin Valley Road in its current alignment. Raise it through McGregor Meadows. Relocate administrative facilities out of the floodplain. Continue to implement 1995 Land Protection Plan (LPP) priorities. Implement erosion protection measures initially at one site.

Alternative 2: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; More Priority Land Exchange/Acquisition in Channel Migration Zone (Environmentally Preferable): Reroute the Stehekin Valley Road out of the channel migration zone around McGregor Meadows and the Lower Field. Relocate administrative facilities (maintenance and housing) out of the floodplain, near the airstrip. Identify new land protection priorities through a revised LPP. Implement erosion protection measures at three sites.

Alternative 3: At-Risk Public Facilities Removed from Channel Migration Zone in Most Areas; Same Land Protection Plan as Alternative 2: Reroute the Stehekin Valley Road out of the channel migration zone only around McGregor Meadows. Relocate administrative facilities out of the floodplain, near the airstrip. Identify new land protection priorities through a revised LPP. Implement erosion protection measures at five sites.

Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less Priority Land Exchange / Acquisition in Channel Migration Zone: Maintain the existing alignment of the Stehekin Valley Road. Raise it through McGregor Meadows. Relocate administrative facilities out of the floodplain, near the airstrip. Identify new land protection priorities through a revised LPP (differently than in Alternatives 2 and 3). Implement erosion protection measures at seven sites.

Alternative 5: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; Priority Land Exchange/Acquisition in Most Vulnerable Areas (NPS Preferred): This alternative modifies Alternative 2 based on DEIS public comments. Provide a connecting road from the reroute to McGregor Meadows. Identify LPP priorities based on revised criteria that focus primarily on flood and erosion threats. Relocate maintenance facilities near the airstrip and housing in the lower valley. Other minor changes from Alternative 2 are also called for.

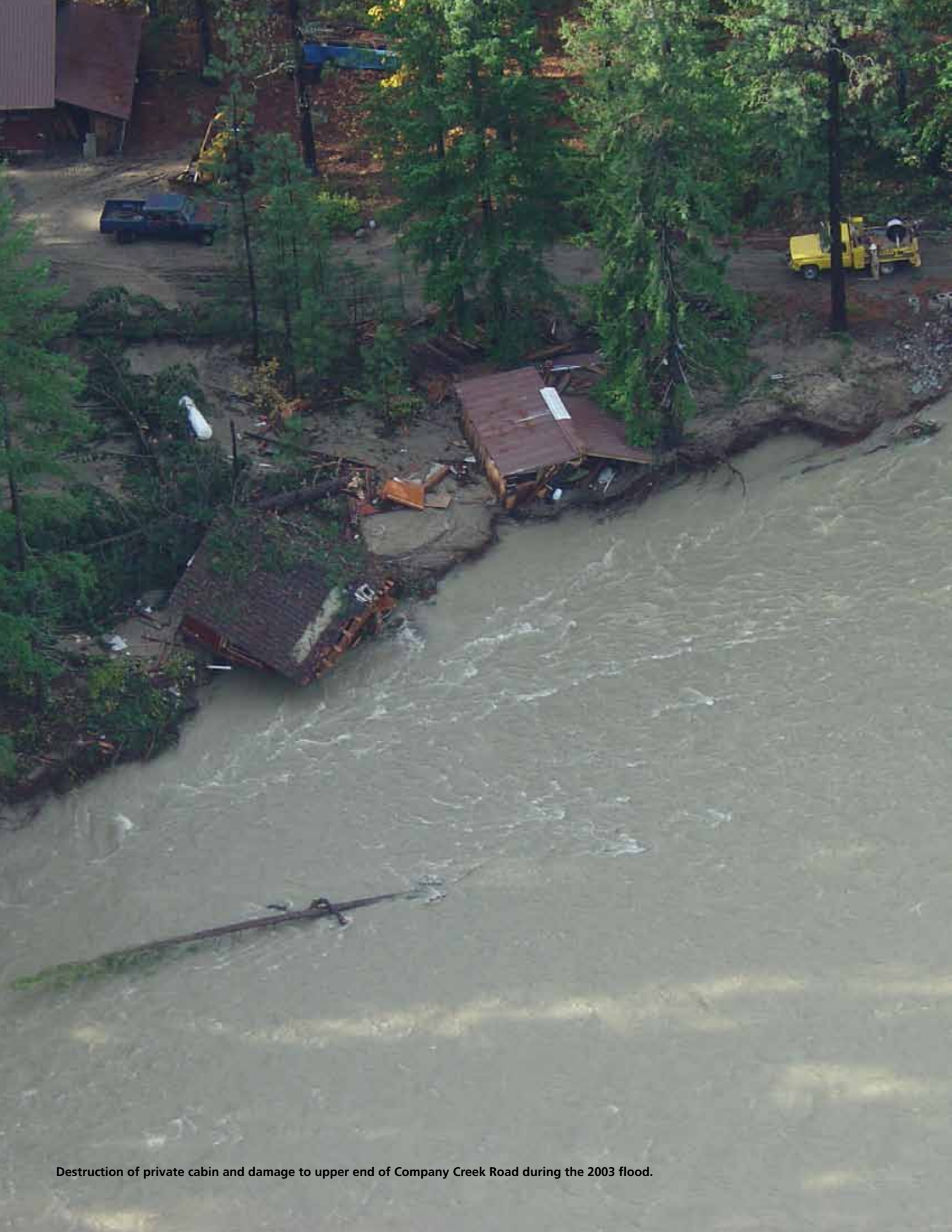
For further information, please contact Superintendent, Attn: Stehekin River Corridor Implementation Plan FEIS, North Cascades National Park Service Complex, 810 State Route 20, Sedro-Woolley, Washington 98284-1239 or call the superintendent's assistant at (360)854-7201.

CHANGES BETWEEN THE DRAFT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

In response to public comments on the DEIS, the following changes have been made in the FEIS:

- An Alternative 5 was added in the FEIS as a modified version of Alternative 2. This alternative includes:
    - A Reroute Access Connector (a 940 - 1,200 foot long road that would connect the Alternative 2 reroute with the McGregor Meadows area) across public and private land.
    - Revisions to the Land Protection Plan, including modifications to the LPP criteria for determining priority interest in parcels within the most vulnerable areas (floodplain / channel migration zone in McGregor Meadows and near the Stehekin River mouth and debris flow hazard zones) and to add scenic criteria near the head of the lake that resulted in a revised tract priority list for Alternative 5.
    - Different locations where future employee housing could be considered in the lower valley.
    - Adjustments to the proposed route and use of the Lower Valley Trail.
    - The potential for several grade control structures to be constructed through public-private partnerships to improve the ability to retain the McGregor Meadows Access Road.
    - A box culvert, rather than a low water crossing, at Milepost 8.5 to improve bicycle access.
    - Other modifications to reduce overall impacts.
- The socioeconomics section in Chapter III: Affected Environment and Chapter IV: Environmental Consequences was updated. The section in Chapter III also expands the discussion beyond those areas that could be impacted by the proposed actions in Alternatives 1-5.
- One of the purpose statements, the alternative titles, and the statement describing the Federal Highway Administration as a cooperating agency were changed slightly.
- Based on additional (75 percent) design by FHWA, changes were incorporated in the proposed design of the roadway components of the alternatives.
- Based on additional design by the NPS, erosion protection measures were modified.
- The sections “Impact Topics Dismissed from Further Consideration” and “Alternatives and Actions Considered but Dismissed” were modified.
- The Floodplains Statement of Findings was combined with a new Wetlands Statement of Findings.
- Several appendices were modified, including Appendix 8: Vascular Plants Observed within Proposed Project Areas and Appendix 19: Carbon Emission Estimates and Calculations.
- Several appendices were added, including Appendix 20: USFWS Biological Opinion, Appendix 21: NPS Response to Comments on the DEIS, and Appendix 22: Agency, Organization and Business Comment Letters.

- New environmental impact analysis for Alternative 5 was added to the FEIS.
- Some modifications were made to the environmental impact analysis of Alternatives 1 - 4 based on additional design by FHWA and for consistency with the USFWS Biological Opinion.
- Some modifications to the environmental impact analysis were also made to include new or expanded information provided by resource specialists from North Cascades NPS Complex and/or to clarify the extent of impacts.
- Changes / additions were made to Chapter V: Consultation and Coordination to update addresses, individuals, businesses, and organizations and to update sections referring to consultation on the FEIS, including a description of the DEIS comment process and a summary of comments.
- Editorial changes were made throughout the FEIS to clarify previous language and to improve descriptions of proposed alternative components and analysis.
- Maps and figures were revised to improve accuracy of descriptions.
- Minor editorial changes were made to reduce the number of missing or wrong words and typographical errors.



Destruction of private cabin and damage to upper end of Company Creek Road during the 2003 flood.

EXECUTIVE SUMMARY

The *Stehekin River Corridor Implementation Plan and Final Environmental Impact Statement* (FEIS) 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). 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 exchange / acquisition.

Alternatives 1 - 5 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 NRA General Management Plan / Environmental Impact Statement (GMP/EIS) (NPS LACH 1995a). Alternative 5 is identified as the agency-preferred alternative, while Alternative 2 is identified as the environmentally preferable alternative. Alternative 5 is a modification of Alternative 2 in response to public comments. It is also updated based on additional design modifications.

The NPS is the lead agency in the development of this Environmental Impact Statement (EIS) and has identified a need to evaluate comprehensive and sustainable management strategies and linked public-private actions to address the consequences of flooding. The Federal Highway Administration (FHWA) is a cooperating agency because the proposed action involves funds for which the FHWA is responsible and roadway construction for which the FHWA is providing technical expertise and construction contract administration services. All alternatives involve various treatments of the Stehekin Valley Road, for which the FHWA would provide the necessary funding, design, and construction expertise.

The FEIS 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 FEIS 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.

Following publication of the availability of the FEIS in the Federal Register, it will be used to prepare 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 the adjacent wilderness that begins above about 1,640 feet elevation, about 400 feet above the floor of the lower valley (Figure 1: *Project Area—Lower Stehekin Valley* and Figure 2: *Existing Conditions*).

Figure 1: Project Area – Lower Stehekin Valley

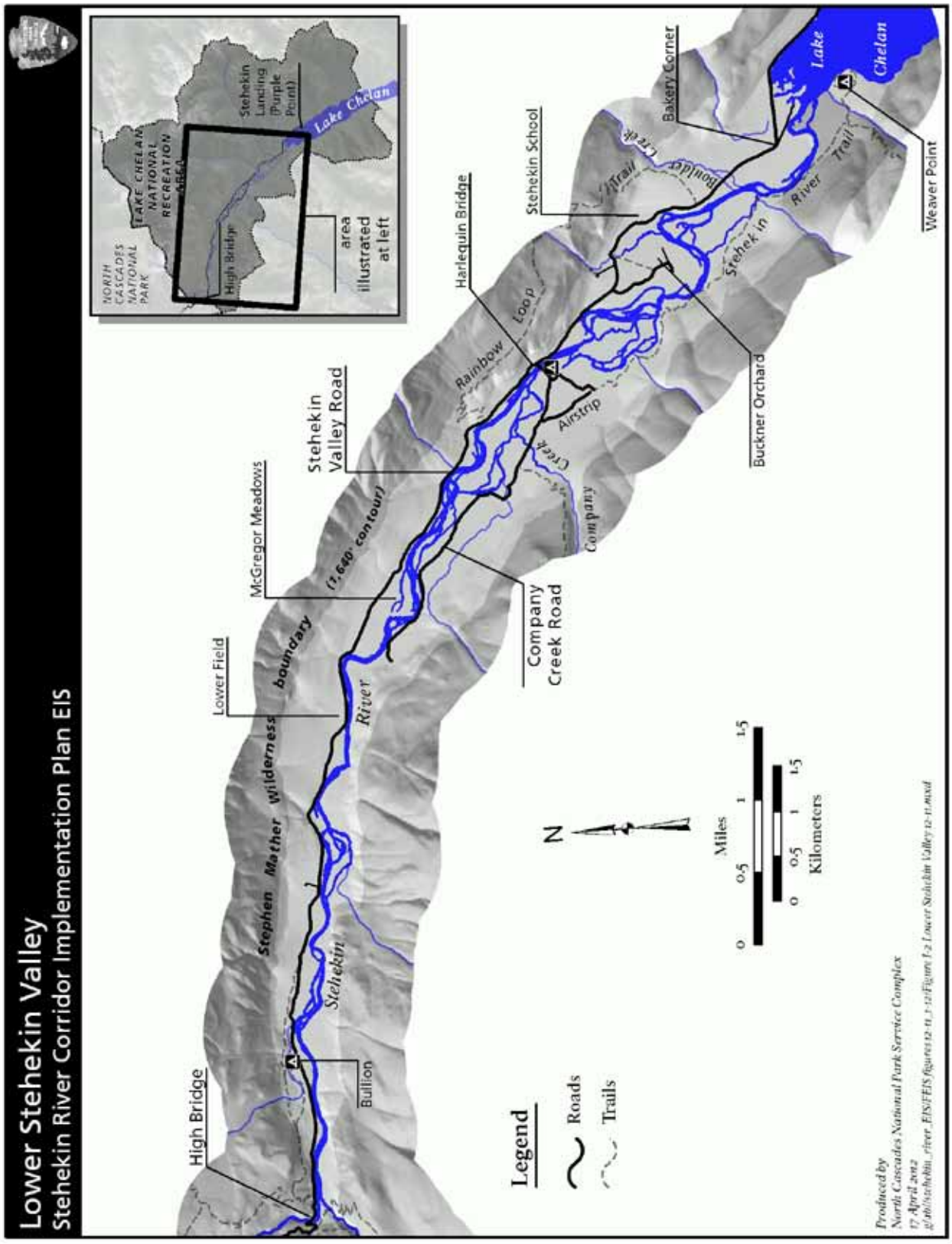
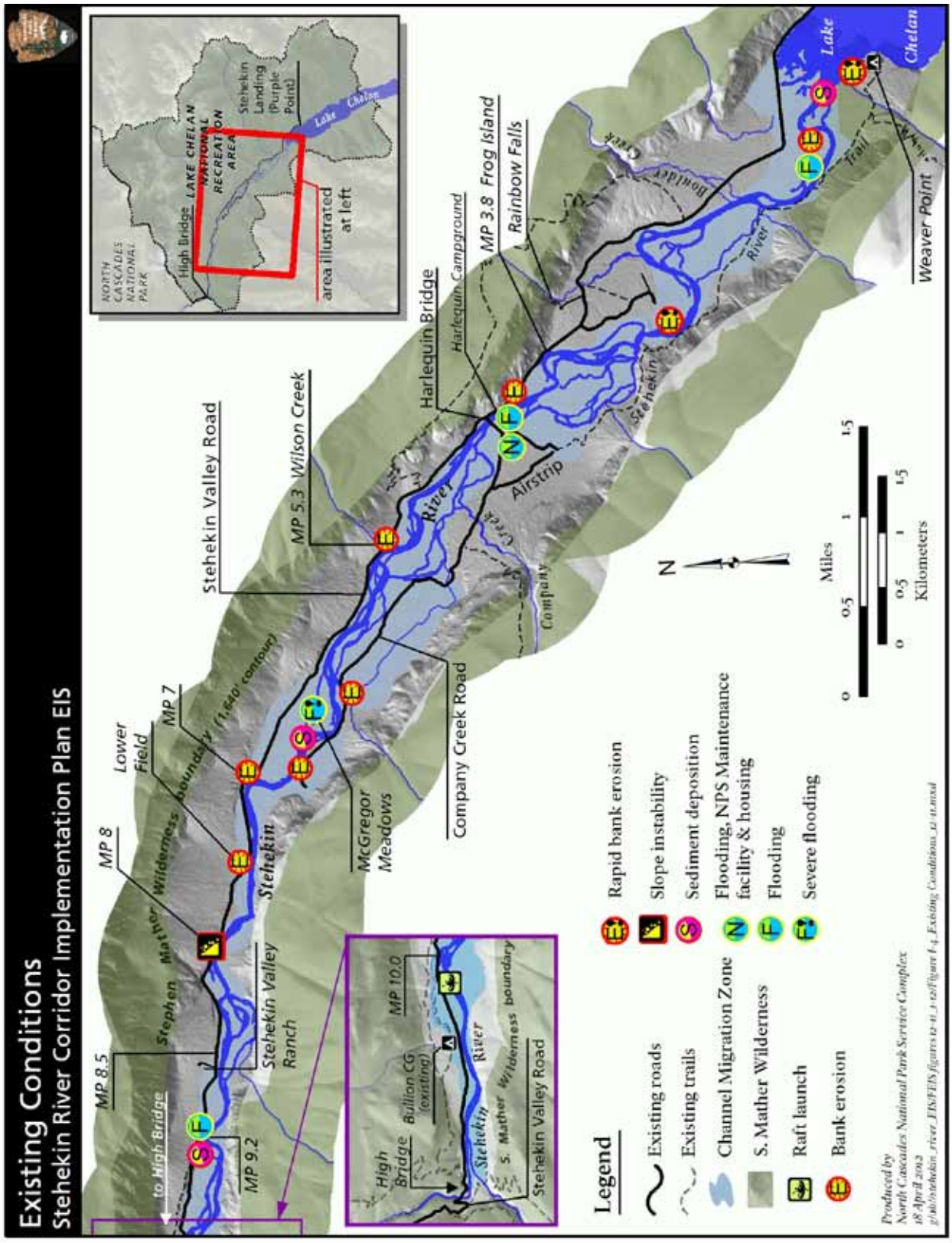


Figure 2: Existing Conditions



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 16 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 purposes of the proposed actions within this Stehekin River Corridor Implementation Plan / Environmental Impact Statement (SRCIP/EIS) are to:

- 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
- Partner with the Stehekin Community to provide services, facilities and experiences for visitors.

These purposes meet the goals and direction provided in the 1995 *Lake Chelan National Recreation Area Final General Management Plan Environmental Impact Statement* (GMP) (NPS LACH 1995a). 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 landowners.

Primary Issues

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 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 severe floods in 1995, 2003, and 2006 have led to significant changes in the Stehekin River channel, and redefined the boundaries for the 100-year flood. As a result, 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.

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 LACH1995a). As a

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

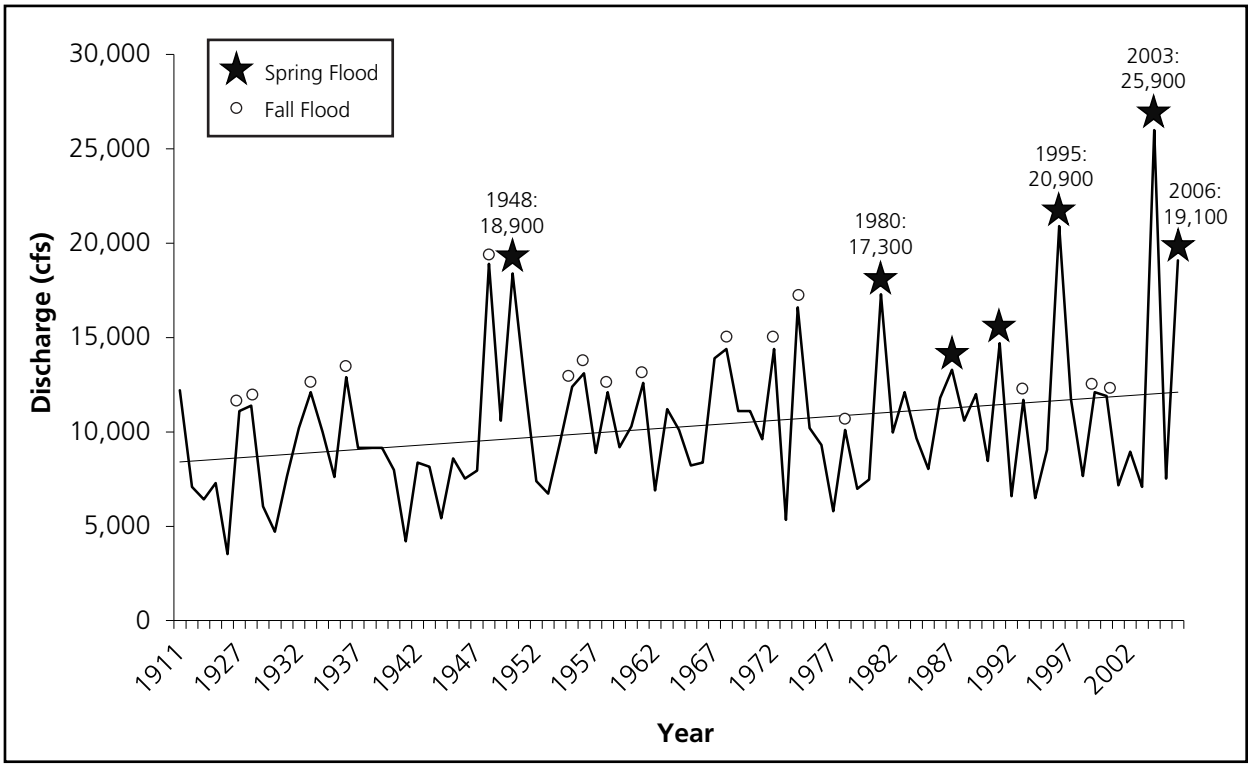


Photo 1 – Private cabin, well, and septic system incorporated into logjam at McGregor Meadows (2003).

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 for power generation on the level of Lake Chelan and the lower Stehekin River. This 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.

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 initiated by the large floods 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.

Manage Limited Funding.

The NPS has spent more than $3 million to react to recent flood damage to maintain vehicle access on the Stehekin Valley and Company Creek roads and to respond to new threats on an event-by-event basis. 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.

Respond to Private Landowners.

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. (The channel migration zone is where the river has historically migrated in the valley over the past 1,000 years.) 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 reaches, or 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 Lake Chelan NRA 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 the *Lake Chelan National Recreation Area Land Protection Plan* (LPP) (NPS LACH 1995b). The LPP identifies and prioritizes private lands for acquisition or exchange from willing sellers. Last updated in 1995, the plan is being revised through this FEIS to address new river-channel and floodplain conditions and to create new funding opportunities to help protect Lake Chelan NRA and the Stehekin Community.

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 available to them. In this case, the superintendent of Lake Chelan NRA (North Cascades NPS 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, and to meet the goals of this plan.

Photo 2 – Rafters on the Stehekin River.

Background

This SRCIP / FEIS 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:

1. The flood prone nature of the Stehekin River, which is due to its geography, watershed shape, and steep slopes, and because of the potential for the formation and sudden failure of debris dams in the narrow canyons above High Bridge;
2. Channel instability from the transport of large amounts of water, gravel, and large wood;
3. A shift in the last 30 years from spring floods to larger, more frequent, fall floods; and
4. 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* of the FEIS. Illustrations of the alternatives are found in Figures 4 through 10.

The FEIS 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 Priority Land Exchange / Acquisition in Channel Migration Zone (Environmentally Preferable)
- Alternative 3: At-Risk Public Facilities Removed from Channel Migration Zone in Most Areas; Same Land Protection Plan as Alternative 2
- Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less Priority Land Exchange / Acquisition in Channel Migration Zone
- Alternative 5: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; Priority Land Exchange / Acquisition in Most Vulnerable Areas (NPS Preferred)

Alternatives 1-4 were described in the SRCIP DEIS. Alternative 5 is a modification of Alternative 2 based on public comments on the DEIS. It incorporates changes suggested by these public comments, including providing access to McGregor Meadows from the proposed reroute as part

of plan actions now, rather than later when existing access is damaged. The existing access road and some driveways would be reinforced in Alternative 5. It also responds to comments on Land Protection Plan priorities to focus on protecting the most vulnerable areas from flood-related impacts. Alternative 5 also offers a slight realignment of the Lower Valley Trail. Other slight modifications, such as a mechanically stabilized earth (MSE) wall, have been added to further reduce impacts from the proposed reroute. In addition, future proposed administrative housing could also be constructed throughout the lower valley rather than only in conjunction with the relocated maintenance facilities as described in Alternatives 1 - 4.

Introduction

All action alternatives are based upon the concept of floodplain utilization to varying degrees. 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 a sustainable approach over the long term. Proposed land use decisions would be based on the channel migration zone (CMZ) of the Stehekin River. The CMZ is defined as the area where the Stehekin River has migrated in the past 1,000 years. Unlike hydraulic model-based floodplain maps, which provide static views of floodplains and are costly, the CMZ provides a more accurate view of the dynamic floodplains associated with steep mountain rivers like the Stehekin.

Consistent with past public-private partnerships on both sides of the river at McGregor Meadows and elsewhere in the valley, this plan identifies new management strategies in partnership with private landowners where public and private concerns overlap. Therefore, the action alternatives attempt to develop sustainable linked public-private actions. 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 and the Stehekin River Mouth, and using the LPP revision to focus on the sites that are most threatened by the river.

For public land, Alternatives 2 - 5 attempt to avoid the channel migration zone, rather than only the 100-year floodplain. The reasons for using this more conservative approach include observed rapid changes in Stehekin floodplain boundaries during large floods; the high cost of computer models to determine flood elevations; and the inaccuracy of the models.

The alternatives conform to Lake Chelan NRA 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* in the FEIS). 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 have more ecological damage, or would require repeated, costly management actions (see "Alternatives and Actions Considered but Dismissed" below; "Alternatives and Actions Considered But Dismissed"in Chapter II and Appendix 18: *Estimates of Gravel Accumulation in Two Reaches of the Stehekin River* of the FEIS).

Summary of Actions Common to All Alternatives (1 - 5)

Several actions in this plan are common to all Alternatives (1 - 5) because they were identified in the GMP. These actions would also protect public facilities or support the concept of floodplain utilization (Figure 4: *Major Actions Common to All Alternatives*).

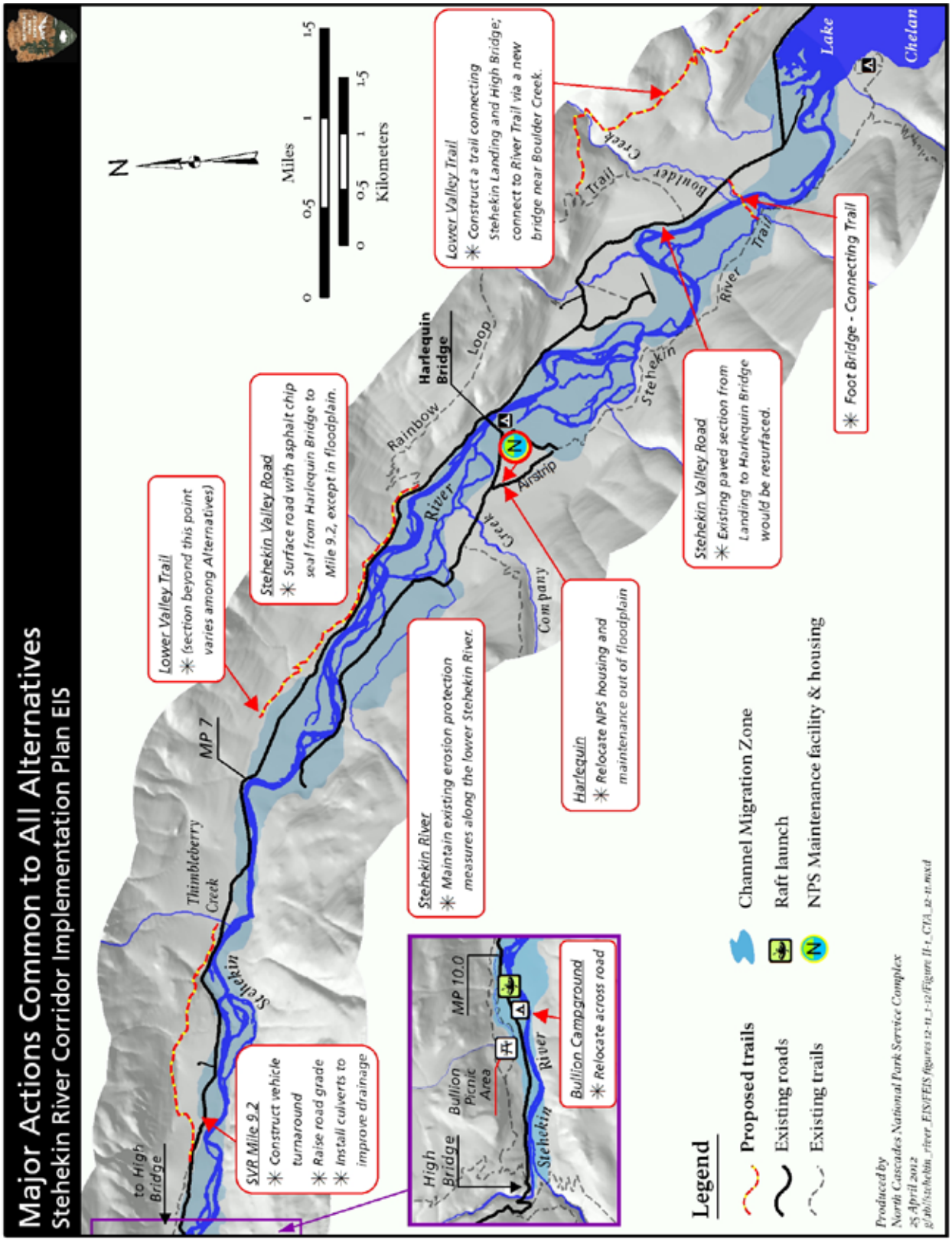
Actions called for by the 1995 Lake Chelan NRA GMP that would be implemented by all alternatives include replacement and relocation/construction of the NPS maintenance compound to the north end of the airstrip; replacement and relocation/construction of administrative housing; creation of a Lower Valley 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 exchange and acquisition to encourage the removal of unsustainable development from the Stehekin River floodplain. Actions involving administrative and maintenance facilities require additional site-specific environmental impact analysis and are not analyzed in detail in the FEIS.

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.

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 1981. 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.

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

Figure 4: Major Actions Common to All Alternatives



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 public-private 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 public roads.

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

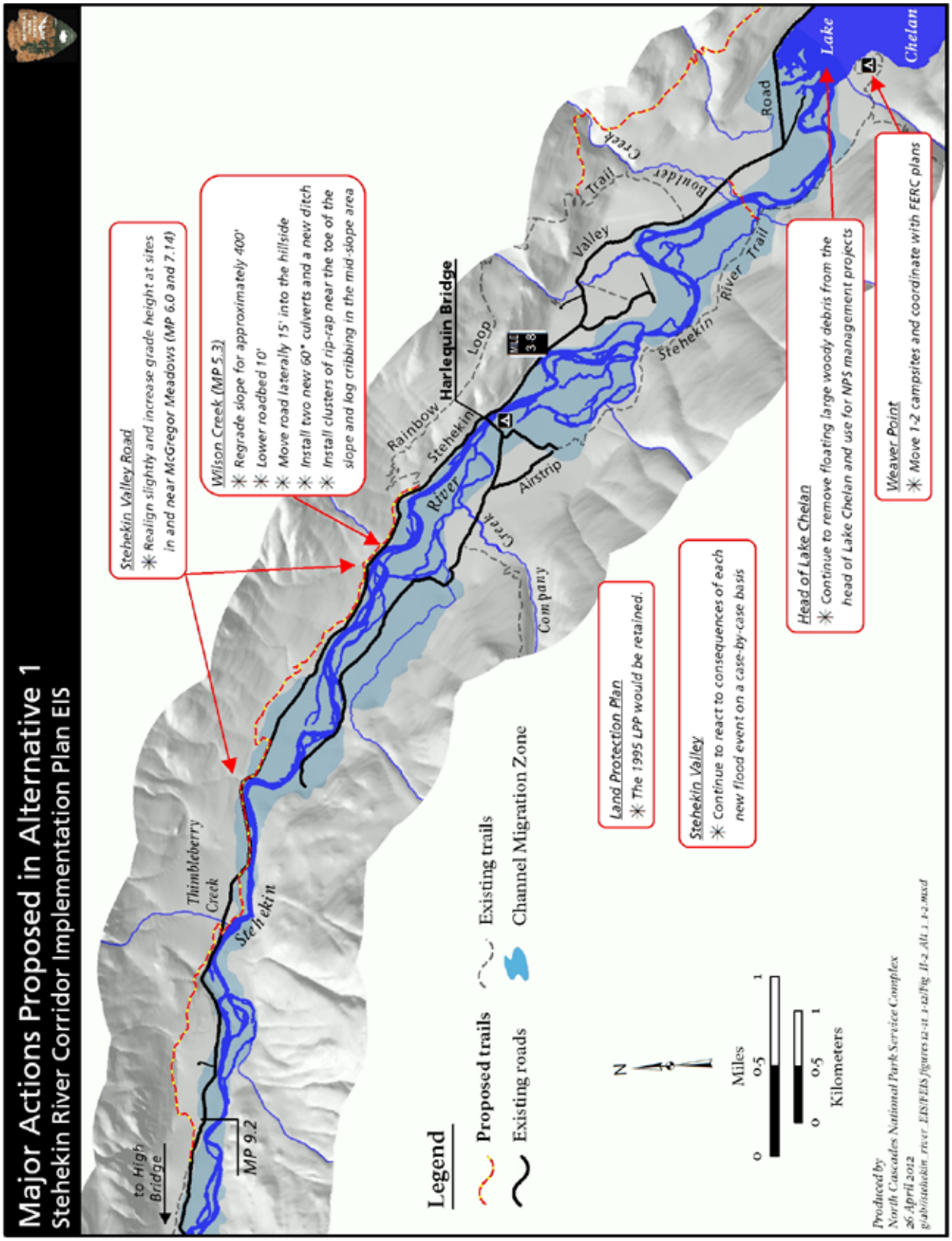
This alternative would continue existing management practices and improvements called for by existing plans evaluated and selected in the 2005 Stehekin Valley Road Improvement Project EA and associated Finding of No Significant Impact (Figure 5: *Major Actions Proposed in Alternative 1*). It also includes continuing implementation of the 1995 GMP, as described previously under "Actions Common to All Alternatives (1 - 5)" and the 1995 LPP.

Implementation of the 1995 LPP would continue, using existing criteria and potential exchange lands. Decisions regarding land exchange / acquisition priorities would continue to be based on properties identified with currently out-of-date floodplain boundaries and the goal of protecting 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.

Stehekin Valley Road Improvement Project actions would be implemented and would include rehabilitation and surfacing of the road with an asphalt chipseal for 4.9 miles from Harlequin Bridge to the winter turnaround (Milepost 9.2), except for areas within the floodplain. There would be a 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 approximately 5,600 cubic yards of fill through McGregor Meadows, as well as implementation of erosion protection measures at Wilson Creek (riprap clusters) (NPS LACH 2005). To retain the roads, 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; traffic control striping; and sign replacement, would also continue as needed. It is anticipated that existing pavement would be resurfaced (from the Landing to Milepost 9.2) during or shortly after road projects above Harlequin Bridge.

In Alternative 1, unlike 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 (EAs) as needed to implement management actions.

Figure 5: Major Actions Proposed in Alternative 1



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 FEIS. 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 in the FEIS), 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 - 5)

In addition to the actions that would be common to Alternatives 1 - 5, there are a variety of elements common to Alternatives 2 - 5, including proactive measures to protect administrative and public facilities from the future consequences of flooding.

Photo 4 – Floor of NPS Maintenance Shop after 2003 flood.

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, and scaling (removing) rocks below this. A rockery wall (100 - 150 feet long and three to eight feet high) would also be added at the base of a portion 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 on private lands after collection by the NPS.

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. 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. This would be modified in Alternative 5 with the construction of the Reroute Access Connector, which would link private property in McGregor Meadows to the rerouted Stehekin Valley Road.

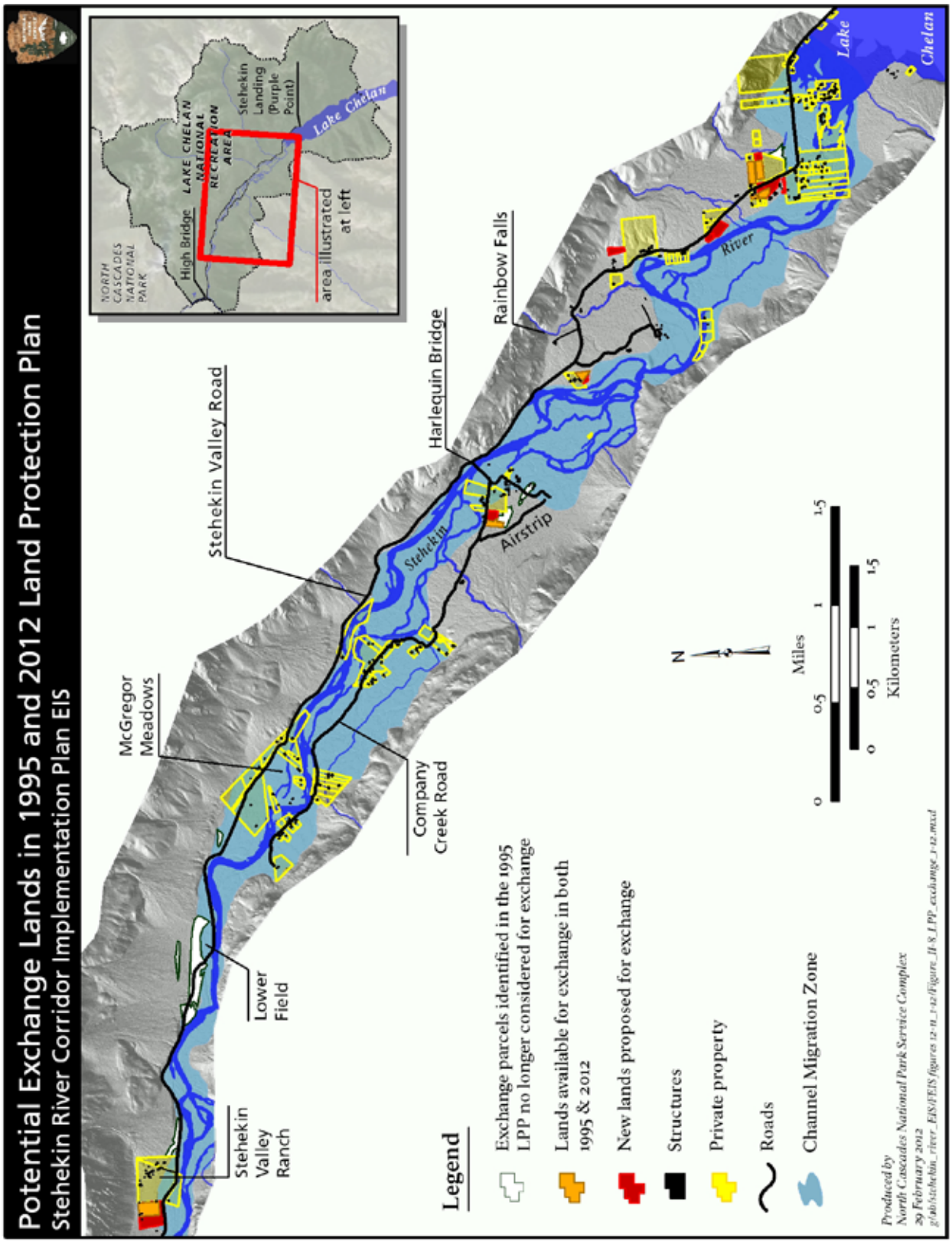
Land Protection Plan

The NPS would make new exchange lands available through the revised Land Protection Plan (Figure 6: *Potential Exchange Lands in the 1995 and 2012 Revised Land Protection Plan*).

Recreational Facilities

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

Figure 6: Potential Exchange Lands in the 1995 and 2012 Revised Draft Land Protection Plan



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

Compared to other alternatives, Alternatives 2 and 5 would allow the Stehekin River the most space to utilize its floodplain and move within its natural channel migration zone over time (Figure 7: *Major Actions Proposed in Alternatives 2 and 5*). Bank stabilization on the left bank is proposed at three new sites to protect the road, including at 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. Therefore rock barbs have been identified for these locations. 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 / habitat restoration measures. Alternative 2 would include limited use of wood from logjams in the river mouth area up to Boulder Creek, where the Stehekin River is influenced by backwater from Lake Chelan during flooding. Such use would only be from the tops of prescreened jams, and only if the jam would not be destabilized. The NPS would collect and stockpile wood from logjams after obtaining permits from federal and state agencies.

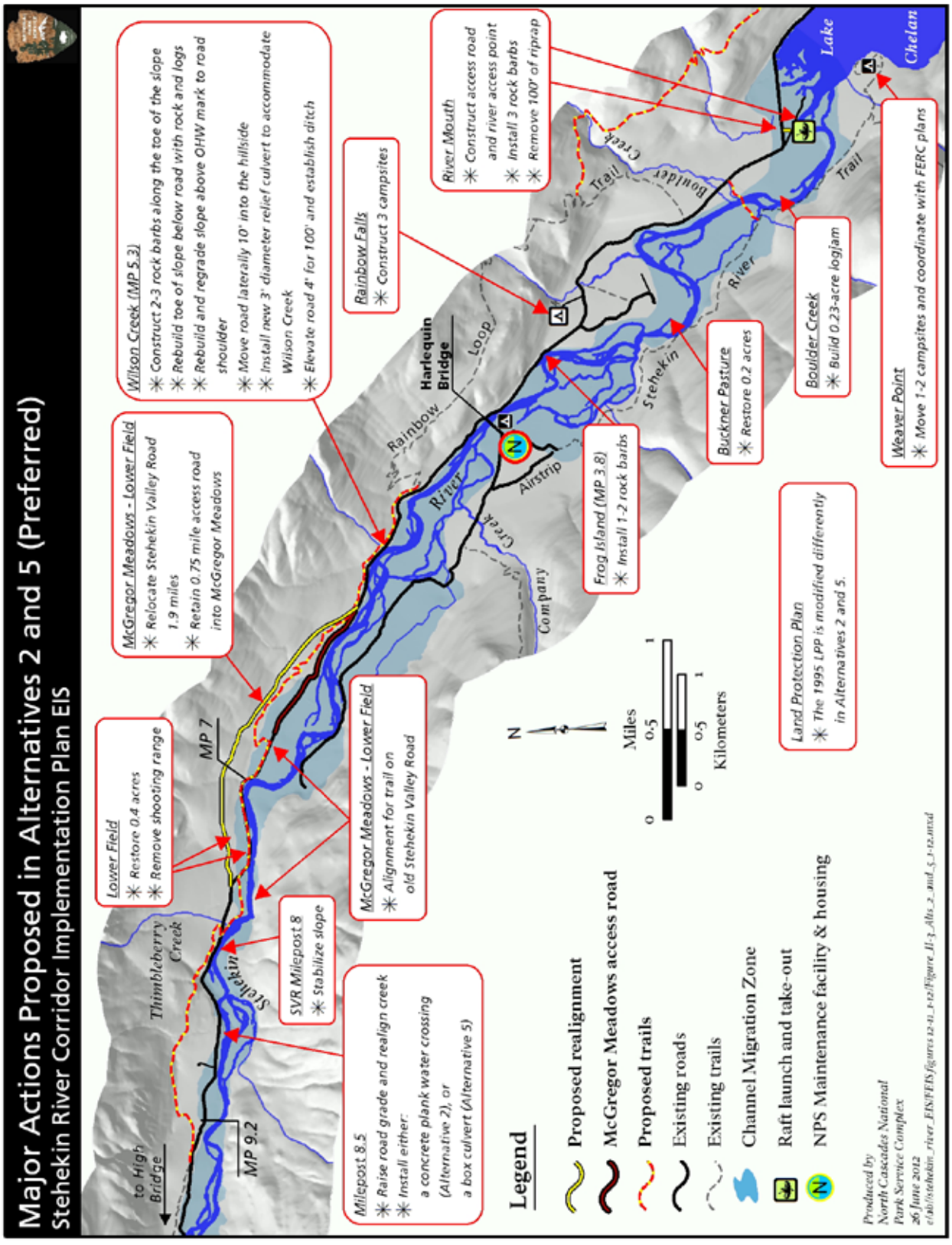
The revised LPP would be used to encourage relocation of private property from within the floodplain / channel migration zone to outside the channel migration zone, using management actions such as land exchange or land acquisition from willing sellers. Land protection priorities would identify specific properties that are most threatened by the Stehekin River as it migrates across its channel migration zone. If development at these sites was 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, 3 and 5 than in Alternative 4 (see Appendix 11 in the FEIS for the priority ranking of private lands in Alternatives 2 and 3 and Appendix 13 in the FEIS for the ranking in Alternative 5). In all action alternatives, 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 8: *McGregor Meadows Reroute Map*). Because the reroute has been professionally designed to meet or exceed modern road standards, the alignment meets key principles for safety, design and maintenance.

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. From a turnaround at the end of the access road, administrative access would continue to be provided to the grade-control structures at Milepost 7.0. 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 chipseal.

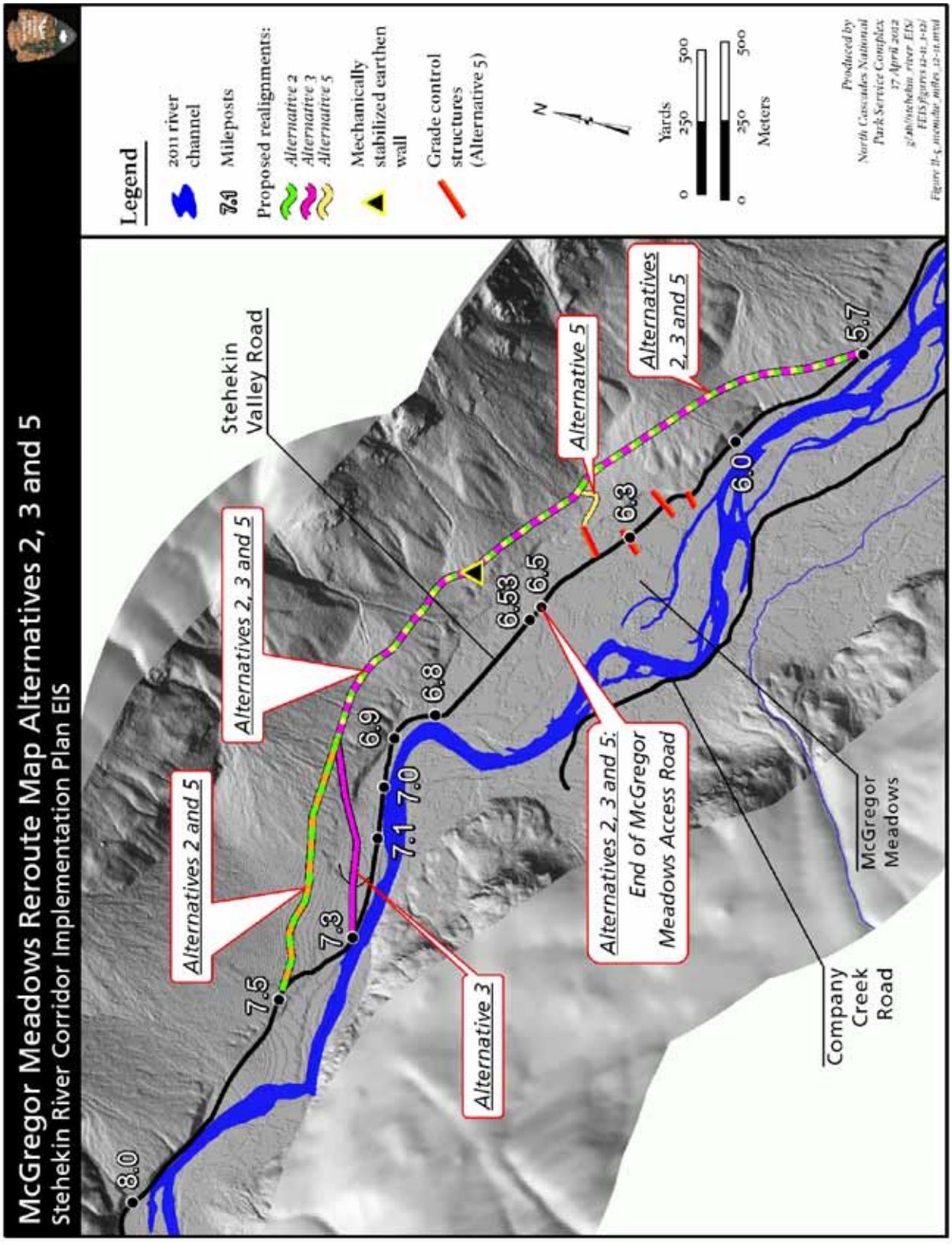
Under Alternative 2, there would also be a series of erosion protection measures to stabilize those sections of the Stehekin Valley Road that are at the edge of the channel migration zone and cannot be relocated without major slope removal or extensive new road construction.

Figure 7: Major Actions Proposed in Alternatives 2 (Environmentally Preferable) and 5 (NPS Preferred)



See Appendix 17 in the Final Environmental Impact Statement for a separate map of Major Actions Proposed in Alternative 5.

Figure 8: McGregor Meadows Reroute Map



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 (looking downstream) 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. 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 (layered planting using native shrubs) would enhance riparian vegetation along the bank, at the Lower Field, Buckner Homestead hayfield and pasture, Wilson Creek, Frog Island, and the river mouth.

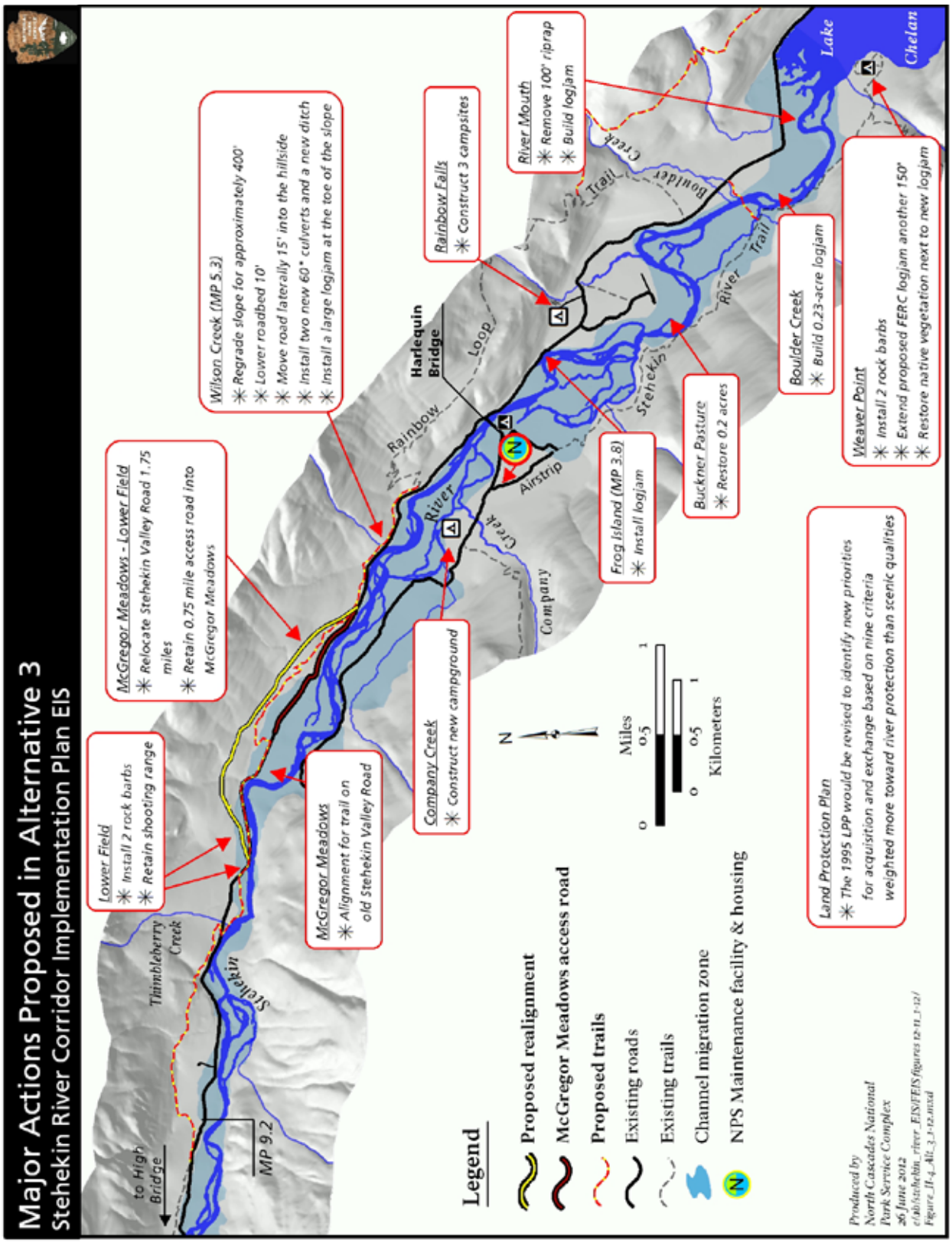
Compared to Alternative 1, Alternatives 2 - 5 would propose some manipulation of woody debris within the Lake Chelan backwater zone (which extends 0.25 mile from the head of the lake at full pool, up the Stehekin River). In this area of the lower Stehekin River and at Harlequin Bridge, large logjams that threatened public roads, water quality, public safety, and regular access to private property could be altered to relieve threats. 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) after it was collected and sorted by the NPS. The wood could only be used in the channel migration zone for erosion protecton and/or restoration projects, and/or Advanced Flood Protection Measures. This action would limit importation of large rock and acknowledges the large amount of wood currently on the river.

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 Alternatives 3 and 5), 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. Approximately three new individual sites would also be located near Rainbow Falls. In addition, a new river access point 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 Protection Plan as Alternative 2

Alternative 3 would allow the Stehekin River slightly less room to move within its natural channel migration zone and requires the use of different erosion protection measures than in Alternatives 2 and 5 (with four barbs and five logjams, instead of six to eight barbs and two logjams as in Alternatives 2 and 5) (Figure 9: *Major Actions Proposed in Alternative 3*). As in other alternatives, Alternative 3 would implement the GMP replacement and relocation of the maintenance facility / housing 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 number of erosion protection measures increases from Alternative 2/5 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 2010 LPP would be used.

Figure 9: Major Actions Proposed in Alternative 3



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 8: *McGregor Meadows Reroute Map*). With the shortening of the reroute (compared to Alternatives 2 and 5), 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 an avulsion sill), at Frog Island, and at Wilson Creek. Restoration and/or bioengineering would also occur in the same locations as in Alternative 2.

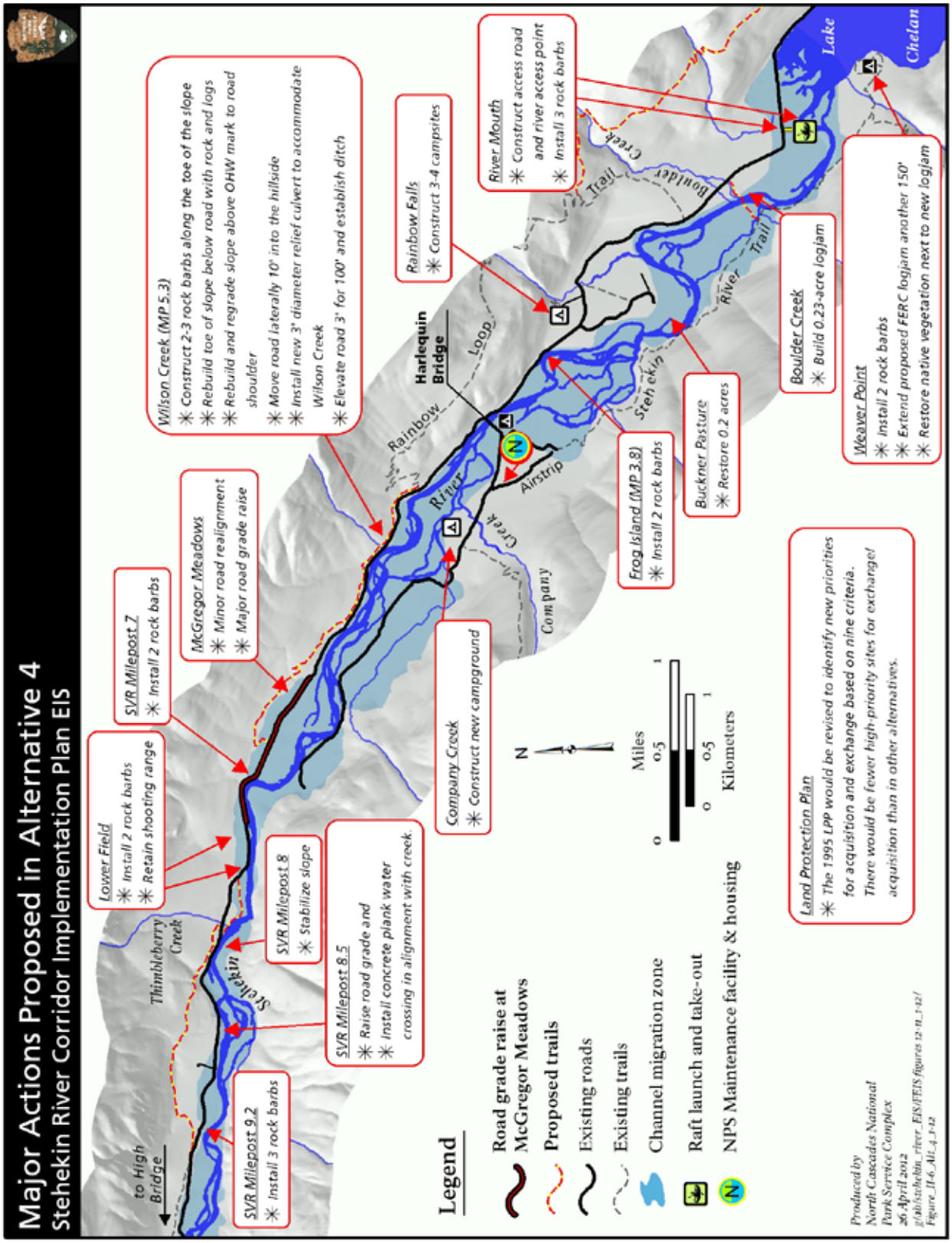
Management of woody debris would be the same as in Alternatives 2 and 5. Recreational improvements would be similar to Alternatives 2 and 5; however, additional camping opportunities would also be provided at Company Creek at a previously disturbed site outside the Stehekin River channel migration zone, and no new river access point would be constructed near the Stehekin River mouth.

Alternative 4: At-Risk Public Facilities Removed from Channel Migration Zone in Some Areas; Less Priority Land Exchange / 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. Unlike Alternatives 2 and 3, if Alternative 4 was selected, the revised 2010 LPP (Appendix 13 in FEIS) would be revised to rank priority lands per the criteria shown in Table II-5 in the FEIS. As in Alternative 1 without a reroute, Alternative 4 would constrain the movement of the Stehekin River from a large part of its floodplain through McGregor Meadows and at Lower Field because it would raise the grade of the road through McGregor Meadows (Figure 10: *Major Actions Proposed in Alternative 4*). The LPP revision would be different than in Alternatives 2 and 3. Appendix 11 in the FEIS lists the priority ranking of private lands for Alternatives 2 and 3; Appendix 12 in the FEIS lists the priority ranking of private lands for Alternative 4. 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 - 5)."

As in Alternatives 2, 3 and 5, 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, the Stehekin Valley Road would be raised in some locations to minimize flood damage, and 4.9 miles of the road would be rehabilitated and surfaced between Harlequin Bridge and the winter turnaround in addition to the area that would be resurfaced from the Landing to Milepost 9.2.

Figure 10: Major Actions Proposed in Alternative 4



There would be additional placement of barbs and bioengineering for erosion protection measures implemented along the Stehekin River, not only at the Lower Field (as in Alternative 3), 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 (7) 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, 3 and 5, 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, 3 and 5, 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 new river access point in this alternative, as in Alternatives 2 and 5. 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.

Alternative 5: At-Risk Public Facilities Removed from Channel Migration Zone Where Possible; Priority Land Exchange / Acquisition in Most Vulnerable Areas (NPS Preferred)

Actions would be similar to Alternative 2, except for the following differences:

- On the proposed reroute of the Stehekin Valley Road a mechanically stabilized earth (MSE) wall would be constructed to avoid a slightly longer reroute with more slope impacts;
- A 940-1,200-feet-long Reroute Access Connector (linking the McGregor Meadows Access Road and the realigned Stehekin Valley Road) would be constructed;
- Instead of implementing the revised 2010 LPP, the LPP would be revised to use a different set of scoring criteria for the priority ranking system;
- In addition to the erosion protection measures identified in Alternative 2, a) four grade control structures could be constructed (beneath three driveways and from the Stehekin Valley Road to the access spur); b) the fill-side shoulder would be stabilized at Skinny Wilson's (Milepost 5.1); and c) there would be a box culvert instead of a concrete plank ford at Milepost 8.5;
- NPS housing could be constructed at other appropriate locations in the lower valley; and
- The location and use of part of the Lower Valley Trail would be modified.

The MSE wall (Figure 7) would be located above NPS Tract #07-157 on the reroute, above an existing private borrow area. The height of the wall would vary from 2-3 feet at the ends to approximately 16 feet near the middle; however the exposed (visible) height would be

approximately three feet less because the bottom part of the wall would be buried. The wall would be approximately 230 feet long and native shrubs and trees would be planted in the soil below the bottom of the wall to help hide the wall face from view. The components of the wall would also be permanently treated to blend with the colors of the surrounding stone and soil. Its construction would reduce the loss of additional large trees along the reroute and would minimize the amount of slope disturbance (cuts and fills) in this steep area.

The MSE wall would be constructed by excavating the wall foundation elevation and then building the wall in layers. Each layer would include wire facing, a geotechnical fabric layer to retain backfill, and a reinforcing layer to connect the facing to the backfill behind the wire. Soil would be overlain on the top of the wall and a guardrail installed along the road shoulder to increase safety.

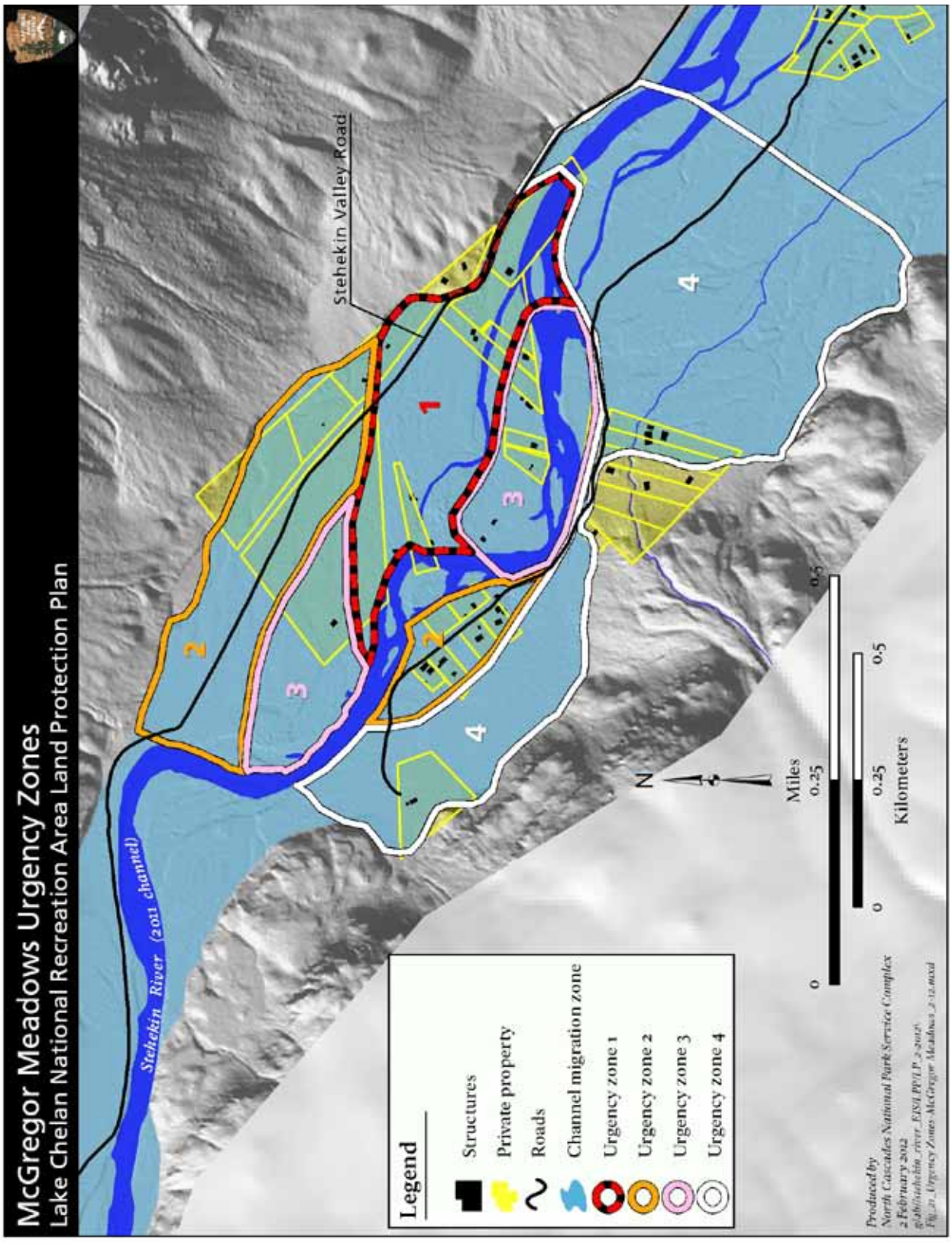
The Reroute Access Connector would provide access to the McGregor Meadows area if the existing alignment washes out and repairs are too expensive and/or the NPS cannot obtain needed permits to repair it (i.e. river runs down road through summer). The connector would be approximately 12-feet wide and 0.22 miles (940 - 1,200 feet) long. From the road reroute, it would be constructed across public and private property (NPS Tract 07-201) under a public-private partnership to join the reroute with the McGregor Meadows Access Road.

As in Alternative 2, the LPP would be used to encourage relocation of private property from within the floodplain / channel migration zone to outside of it, using management actions such as land exchange or land acquisition from willing sellers. Land protection priorities would identify specific properties most threatened by the Stehekin River within McGregor Meadows and other vulnerable areas (deposition zones and active parts of debris cones). As in Alternatives 2 and 3, these criteria would be weighted more toward removing private development from threats by the river than in Alternative 4; however unlike in Alternative 2, the focus of the criteria would also include protection of scenic resources. As in Alternatives 2 - 4, new exchange parcels outside the channel migration zone, or other hazard zones, would be made available, while some lands available for exchange in the 1995 GMP would not be available. One additional parcel (a corral that is part of Tract 05-122) not in the revised 2010 LPP, however, would also be available for exchange, but only for agricultural use. A larger parcel of land (part of Tract 08-104) above the Stehekin Valley Ranch is also proposed for exchange. In Alternative 5, this area would be 10.2 acres, rather than 5.2 acres (as in Alternatives 2 - 4).

The revision to the LPP in Alternative 5 would include eight criteria, including two new ones (visual sensitivity and presence in a debris cone hazard zone). In Alternative 5, the primary driving factors include flooding and streambank erosion impacts on development. Flooding and erosion are most pronounced in areas where the river deposits gravel and large wood. These areas are located at distinct points where the valley widens (McGregor Meadows), between the large tributary alluvial fans of Company, Boulder, and Rainbow Creeks, and at the Stehekin River mouth (Figure 11: *McGregor Meadows Urgency Zones*). Hazardous areas are also located on debris cones where rapid deposition can occur at any time of year. Similar hazard concerns exist for alluvial fans within Lake Chelan NRA, but that threat is considered less severe and the criteria used to evaluate those concerns are weighted less. Other criteria include the presence of wetlands, rare species habitat, and cultural resources, as well as a criterion that emphasizes larger, undeveloped blocks of land within the valley.

Beneath three driveways into McGregor Meadows and from the McGregor Meadows Access Road to the access spur, four new grade control structures could be designed to maintain sheet

Figure 11: McGregor Meadows Urgency Zones



flow, slow avulsion, and to limit the amount of gravel introduced to the Stehekin River from McGregor Meadows. The grade control structures would extend beyond the length of the driveway or roadway area and would be a combined 1,000 feet long, six feet wide and three feet deep, and would be constructed of approximately 600 cubic yards of rock. They would also extend across the Stehekin Valley Road. The grade control structures would need to be constructed through a public-private partnership, with the NPS providing technical assistance and property owners responsible for the construction on their property.

At Milepost 5.1 (across from the Skinny Wilson homestead), 40 feet of road shoulder would be stabilized by constructing a rock wall to replace the decomposing logs that currently support the road shoulder. A large (20-inch) big-leaf maple at one end of the section would be retained.

At Milepost 8.5, instead of a low water crossing as in Alternatives 2 - 4, a box culvert would be used to improve access for bicyclists and the road grade would be raised three to four feet over a distance of approximately 450 feet. The culvert would be approximately 3-4 feet x 6 feet x 30 feet and would have pre-cast concrete wing walls to minimize its length. A removable concrete lid is proposed. To facilitate water reaching the Stehekin River, an outlet relief channel 6-feet wide, 3-feet deep and 100-feet long (following the natural channel) would be created. Rip-rap check dams would be used to slow the flow as it enters the Stehekin River. Tree wells may be required to protect some large cottonwoods near the intersection with the private road. Some, however, may need to be removed. Other smaller trees would need to be removed to create the outlet channel.

Similar to Alternative 2, the NPS maintenance area and some housing would be constructed on land identified in the GMP for that purpose near the airstrip. Unlike Alternative 2, NPS housing could also be constructed in other appropriate locations in the lower valley. As with development of the new maintenance area, additional environmental analysis would be needed.

The Lower Valley Trail alignment would be modified in the vicinity of the Stehekin Valley Ranch to minimize impacts to private property. It could also include another section of multi-use trail from the Stehekin Valley Road to Buckner Orchard using the alignment of the historic entrance (as recommended in the Buckner Homestead Historic District Management Plan). The proposed Lower Valley Trail would be constructed as described in the DEIS except that the trail would not go behind the ranch and would instead connect to the Stehekin Valley Road by linking with the trail at Bullion at Milepost 9.2. Bicycle use would also be allowed on the decommissioned portion of Stehekin Valley Road (McGregor Meadows Access Road and area above Milepost 6.5 to the Lower Field) but there would be no manipulation of the Stehekin River to protect this trail alignment for bicycles. In the future, additional bicycle access would likely be available by implementing the Buckner Homestead Historic District Management Plan recommendation to construct a multi-use trail from the Stehekin Valley Road to Buckner Orchard along the historic entrance road, instead of Buckner Lane (which would be closed to bicycle use). It is envisioned that the Lower Valley Trail could be constructed in segments over an extended period of time (e.g. ten years).

Consistency of Alternatives with Purpose and Need

As explained at the beginning of this section, the primary purposes of this draft Stehekin River Corridor Implementation Plan / environmental impact statement (SRCIP/EIS) are to:

1. Sustainably operate and maintain NPS administrative facilities, public access (via roads and trails), and campgrounds;
2. Protect water quality, scenic values, habitat, and natural processes of the Stehekin River; and
3. Partner with the Stehekin Community to provide services, facilities and experiences for visitors.

These purposes are consistent with the Lake Chelan NRA GMP (NPS LACH 1995).

All action alternatives (2 - 5) would improve the sustainability of the Stehekin Valley Road and would relocate administrative facilities currently in the floodplain / channel migration zone. Alternatives 2 and 5, however, would best meet this purpose because they would move most of the Stehekin Valley Road out of the floodplain / channel migration zone, therefore resulting in more sustainable NPS administrative facilities and public access.

Because Alternatives 2 and 5 would relocate a greater portion of the Stehekin Valley Road out of the floodplain / channel migration zone and would locate fewer erosion protection measures within the Stehekin River, they would best protect water quality and the natural processes of the Stehekin River. Alternatives 1 and 4 would protect the greatest degree of forested habitat, while Alternatives 2 and 5 would enhance the greatest degree of riparian habitat. Compared to Alternative 1, Alternatives 2 - 5 would reduce the amount of land that could be exchanged and would focus remaining land protection on the sites most at risk.

Maintaining the Stehekin Valley Road for vehicle access up to High Bridge would continue to enable people to access the entire length of Lake Chelan NRA and to reach North Cascades National Park. Loss or closure of the road at some mid-point could result in reduced access to recreational opportunities, including hiking, camping, picnicking, river rafting and wildlife viewing. Loss of access at some mid-point, depending on where it occurred, could also reduce vehicle access to private property along the road corridor. The Lake Chelan GMP calls for retaining vehicle access to High Bridge to meet these needs.

The revised LPP would meet the needs of the NPS to protect the values of Lake Chelan NRA and could also help the community by providing sustainable sites for future development outside the Stehekin River channel migration zone and by continuing to provide access on the lower Stehekin Valley Road.

LIST OF ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED

Under the NEPA,(40 CFR 1502.14 (a)), CEQ's Frequently Asked Questions and NPS Director's Order 12, 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.

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 the FEIS:

- 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 and/or erosion protection.
- Take action as part of the plan solely to protect private property.
- Reroute the Stehekin Valley Road at Milepost 8.0.
- Reestablish the southside Stehekin Valley Road along the Company Creek Road alignment, including constructing a new bridge.
- The scope of the plan should encompass 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 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 Stehekin Valley Road at Milepost 9.2.
- Lower Field Land Exchange
- Lower the Stehekin Valley Road at Wilson Creek
- Remove trees near Wilson Creek to improve sight distance
- Reroute the Stehekin Valley Road around private property near the beginning of the reroute.
- Pave the Stehekin Valley Road shoulders
- Construct a culvert, rather than a low water crossing at Milepost 9.2
- Retain the Stehekin Valley Road in McGregor Meadows and add a road reroute later and other selected actions
- Construct one half of the reroute, depending on which part of the McGregor Meadows section of the Stehekin Valley Road would be most likely to blow out
- Construct the proposed Rainbow Falls Camp at the historic location of this camp
- Relocate the Shooting Range in Alternative 5.

Photo 5 – Harlequin Bridge.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Implementing regulations for NEPA promulgated by the CEQ require that agencies identify "the alternative or alternatives which were considered to be environmentally preferable." "Environmentally preferable" is defined as the alternative that will promote the national environmental policy as expressed in Section 101 of NEPA, including:

- Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
- Ensuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
- Preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources. (NEPA Section 101(b))

The environmentally preferable alternative is "the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources (46 FR 18026 - 18038). According to Director's Order 12, through identification of the environmentally preferable alternative, the NPS and the public are faced with determining the relative merits of the choices before them as represented among the alternatives and must clearly state through the decision-making process what values and policies were used in reaching a decision. As shown through the analysis below, the environmentally preferable alternative is Alternative 2, as was described in the DEIS.

1. **Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations:** All Alternatives (1 - 5) would fulfill this CEQ criterion because the NPS is required by law and policy to minimize its impacts on the environment and to preserve natural, cultural, and other park resources without impairment in its management of national parks, including Lake Chelan NRA. Of the alternatives, Alternatives 1 and 4 would have the fewest new impacts on Lake Chelan NRA resources, while Alternatives 2, 3 and 5 would have the fewest impacts on the floodplain / channel migration zone of the Stehekin River. Alternatives 2, 3 and 5 also represent more sustainable, long-term solutions to current issues. Alternatives 2 - 5 would improve existing adverse impacts to water resources by removing development from both the floodplain and channel migration zone of the Stehekin River. Because Alternatives 2, 3 and 5 would employ fewer erosion protection structures and would reroute the road away from the floodplain / channel migration zone of the Stehekin River instead of continuing to add structures to harden the banks of the river, Alternatives 2 and 3 and 5 would best meet the first CEQ criterion.

2. **Ensuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings:** Alternatives 2 - 5 would meet this CEQ criterion by minimizing impacts through implementation of mitigation measures, including impact avoidance and best management practices. Alternatives 2, 3 and 5 would improve safety for employees, residents, and visitors to Lake Chelan NRA by relocating part of the road out of the floodplain / channel migration zone. Alternative 3, however, would have a shorter reroute and would remain partially within the floodplain / channel migration zone. Alternative 5 would include construction of the Reroute Access Connector across a wetland and the channel migration zone. Therefore, Alternative 2 would best meet this criterion.

3. **Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences:** Beneficial uses in all alternatives would include ongoing residential use, resource preservation, and recreational uses of the lower Stehekin Valley. Recreational uses would be broadest in Alternative 4, while protection of the Stehekin River floodplain / channel migration zone would be greatest in Alternatives 2 and 5. Alternatives 2 - 5 would also increase the diversity of recreational experiences through new campgrounds (Alternatives 2 - 5) and a new river access point (Alternatives 2 and 5). The fewest new short-term impacts to existing resources would occur in Alternative 1. Safety improvements associated with the Stehekin Valley Road would occur in all alternatives. As noted above, Alternatives 2, 3 and 5 would also have the greatest safety improvements from relocation of part of the Stehekin Valley Road out of floodplain. Overall, Alternatives 2 and 5 would best meet this criterion.

4. **Preserving important historic, cultural, and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice:** Although all alternatives would preserve historic and cultural resources, enhancement through interpretation would occur in Alternatives 2 - 5, which would best meet this criterion. None of the alternatives would affect portions of the Old Wagon Road or other resources eligible for the National Register.

5. **Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities:** The LPP revision implemented in Alternatives 2 - 4 would meet this CEQ criterion, because it would reduce the number of acres available for land exchanges and remove some sensitive lands still available in Alternative 1. The LPP revision in Alternative 5 would also have similar results. Among Alternatives 2 - 5, Alternatives 2, 3 and 5 would best meet this criterion because their intent is to remove development that is adversely affecting or could adversely affect the Stehekin River and its floodplain, but also its channel migration zone. They also would remove a portion of the Stehekin Valley Road from within the floodplain / channel migration zone to higher ground. Private developments now threatened by the changing flood regime on the Stehekin River would be identified as high priority for exchange or acquisition, thereby allowing affected property owners a means to avoid future flooding impacts if they so choose. Although Alternative 5 would also provide long-term access to the McGregor Meadows area, it would do so by affecting a wetland and a small part of the channel migration zone, therefore Alternative 2 would best meet this criterion.

6. **Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources:** All Alternatives (1 - 5) would best meet this CEQ criterion because of the removal of the current maintenance facility and NPS housing from the floodplain and construction of new maintenance facility and housing on disturbed

lands near the Stehekin Airstrip. These facilities would meet standards for LEED certification. Of these alternatives, Alternatives 2, 3 and 5 would offer a slight advantage for this criterion because they would employ the least amount of imported resources, relying instead on the reuse of materials from within the proposed reroute areas.

Alternative 2 best meets each of the criteria. Although Alternatives 2, 3 and 5 each meet three or more of the criteria, only Alternative 2 meets all of them, therefore Alternative 2 is the environmentally preferable alternative.

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 related to these topics 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* of the FEIS.

- Land use;
- Air quality;
- Geologic hazards;
- Soils and vegetation;
- Water resources (including hydraulics and streamflow, water quality, wetlands, and floodplains);
- Wildlife;
- Special status wildlife;
- Prehistoric and historic archeological resources;
- Historic structures;
- Cultural landscapes;
- 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; and
- 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 FEIS. 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* of the FEIS.

- Water quantity;
- Special status plants;
- Traditional cultural (ethnographic) resources;
- American Indian Religious Freedom Act;
- Museum collections;
- Wilderness;
- Lightscapes;
- Soundscapes;
- Prime and unique farmlands;
- Energy consumption (carbon footprint of alternatives is discussed in Air Quality);
- Climate change; and
- 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 and/or 50 percent road designs provided by Federal Highway Administration (FHWA) to the North Cascades NPS Complex. Final impact numbers would likely be within ten percent of the numbers provided in Table 1: *Impact Assumptions* and throughout the FEIS. 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. Some additional assumptions implicit in the environmental analysis are also contained in the introduction to Chapter IV: *Environmental Consequences* of the FEIS.

Table 1: Impact Assumptions

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Stehekin Valley Road proposed paving mileage	9.2 miles	Same as Alt 1	Same as Alt 1	Same as Alt 1	Same as Alt 1
Stehekin Valley Road rehabilitation mileage (Harlequin Bridge to Winter Turnaround)	4.9 mi	Same as Alt 1	Same as Alt 1	Same as Alt 1	Same as Alt 1
Actual area (Alt 1: road length × 14 ft, Alts 2 - 5: x 16 ft)	8.3 ac	9.4 ac	Same as Alt 2	Same as Alt 2	9.6 ac
Site-specific road improvements (pullouts, winter turnaround,Wilson Creek, Thimbleberry Creek)	2.3 ac	2.4 ac	2.4 ac	Same as Alt 1	Same as Alt 2
Stehekin Valley Road Reroute	N/A	13 ac	13 ac	N/A	13 ac
Reroute Access Connector	N/A	N/A	N/A	N/A	1.0 - 1.2 ac
McGregor Meadows Access Road	N/A	1.3 ac (0.8 mi)	Same as Alt 2	N/A	Same as Alt 2
Estimated lands available for exchange	37 ac	24 ac	Same as Alt 2	Same as Alt 2	29 ac
Number of barbs (acres)	0	6 - 8 (0.5)	4 (0.3)	16 - 17 (1.1)	Same as Alt 2
Number of logjams (acres)	0	2 (0.1)	5 (0.3)	3 (0.1)	Same as Alt 2
Maintenance / housing relocation	5 - 8 ac	Same as Alt 1	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	Same as Alt 2
Restoration					
a. Riparian	1.5 ac	4.1 ac	3.9 ac	2.9 ac	Same as Alt 2
b. Upland	3.6 ac	4.4 ac	3.7 ac	3.7 ac	Same as Alt 2
c. Bioengineering (barbs and logjams)	n/a	0.6 ac	0.6 ac	1.2 ac	Same as Alt 2
Total restoration (a+b+c)	5.1 ac	9.1 ac	8.2 ac	7.8 ac	Same as Alt 2
Total disturbance					
	10 ac (new) 37 ac (LPP) 12 ac (existing)	23 ac (new) 24 ac (LPP) 8 ac (existing)	23 ac (new) 24 ac (LPP) 9 ac (existing)	11 ac (new) 24 ac (LPP) 12 ac (existing)	24 ac (new) 29 ac (LPP) 8 ac (existing)

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.

A summary of major and other key adverse and beneficial impacts that would occur under the alternatives is found in Table 1: *Impact Assumptions*. These impacts are further defined in Chapter IV of the FEIS. In Table IV-16: *Impact Comparison Chart* in the FEIS, the range of major, moderate, minor, and negligible impacts are described. For each impact topic, effects of the alternatives are assessed by context, type, duration, area, and intensity, and each section includes a discussion of cumulative impacts.

Alternatives 2 and 5 have 19 major benefits in 13 impact categories, while six major adverse impacts occur in four categories (Figure 12: *SRCIP Major Beneficial and Adverse Impacts Alternatives 2 and 5*). One of the major impacts is short-term, and involves initial disturbance to vegetation and soils from road reroute construction. Multiple benefits to some impact categories in Alternatives 2 and 5 would occur in soils and vegetation, hydraulics and streamflow, water quality, floodplains, and NPS operations (Figure 12). Some of the actions in these alternatives, such as the maintenance relocation and the road reroute, have both major benefits, and hazardous materials impact categories. An updated Land Protection Plan in Alternatives 2, 3, 4 and 5 would create opportunities for private landowners and the NPS to relocate some of the most threatened floodplain development. As shown in Figure 13: *SRCIP Major Beneficial and Adverse Impacts Alternatives 1 and 4*, Alternatives 1 and 4 have fewer major beneficial effects (10) than Alternatives 2, 3 and 5.

Most of the major adverse impacts in Alternatives 2, 3 and 5 would be associated with short- and long-term disturbance to land use, vegetation and soils, water quality, and wildlife during construction of the new road reroute around McGregor Meadows and NPS facilities. The reroute includes the possibility of disturbing 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 area would likely 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 from installation of new erosion protection structures. Alternatives 2 and 5 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 7.8%. 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 would have a larger impact than at the other two sites. At Frog Island and the Stehekin River mouth, impacts would be reduced because rock barbs and bioengineering would replace existing rip-rap.

Figure 12: SRCIP Major Beneficial and Adverse Impacts Alternatives 2 and 5 (Preferred)

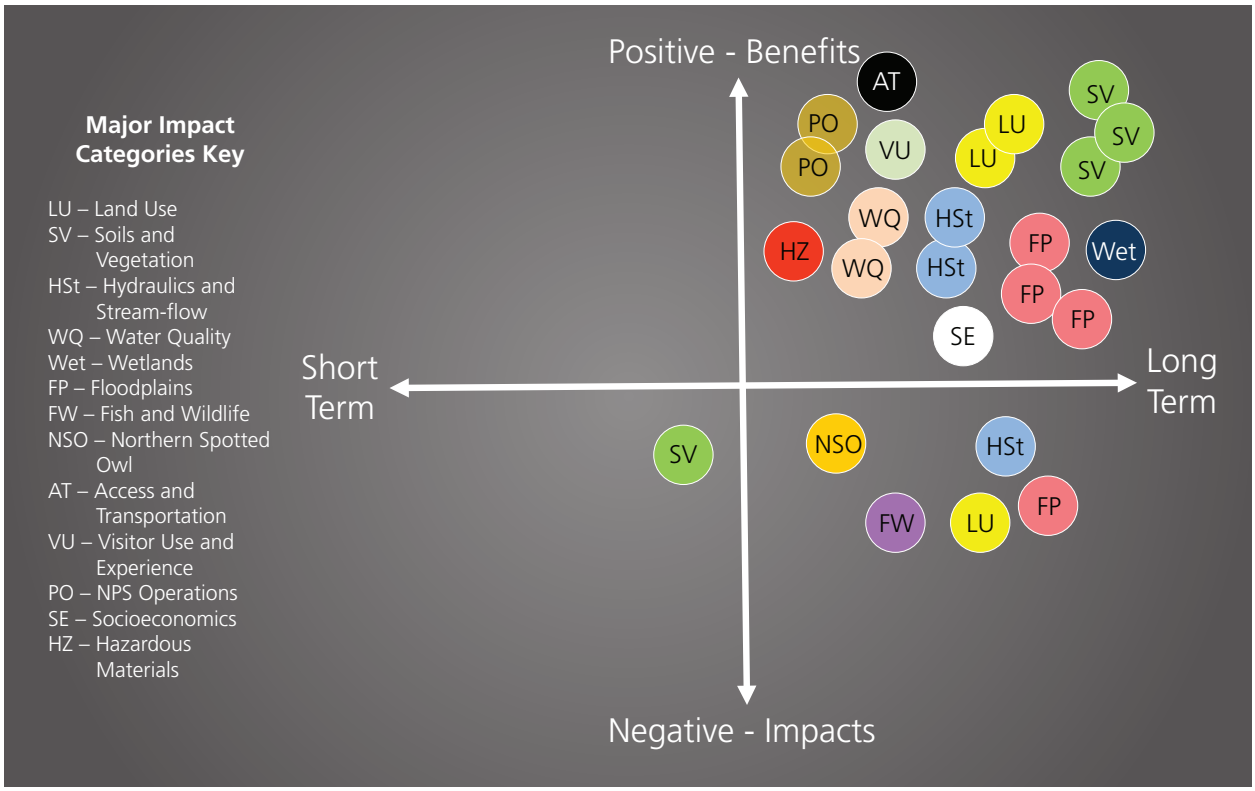
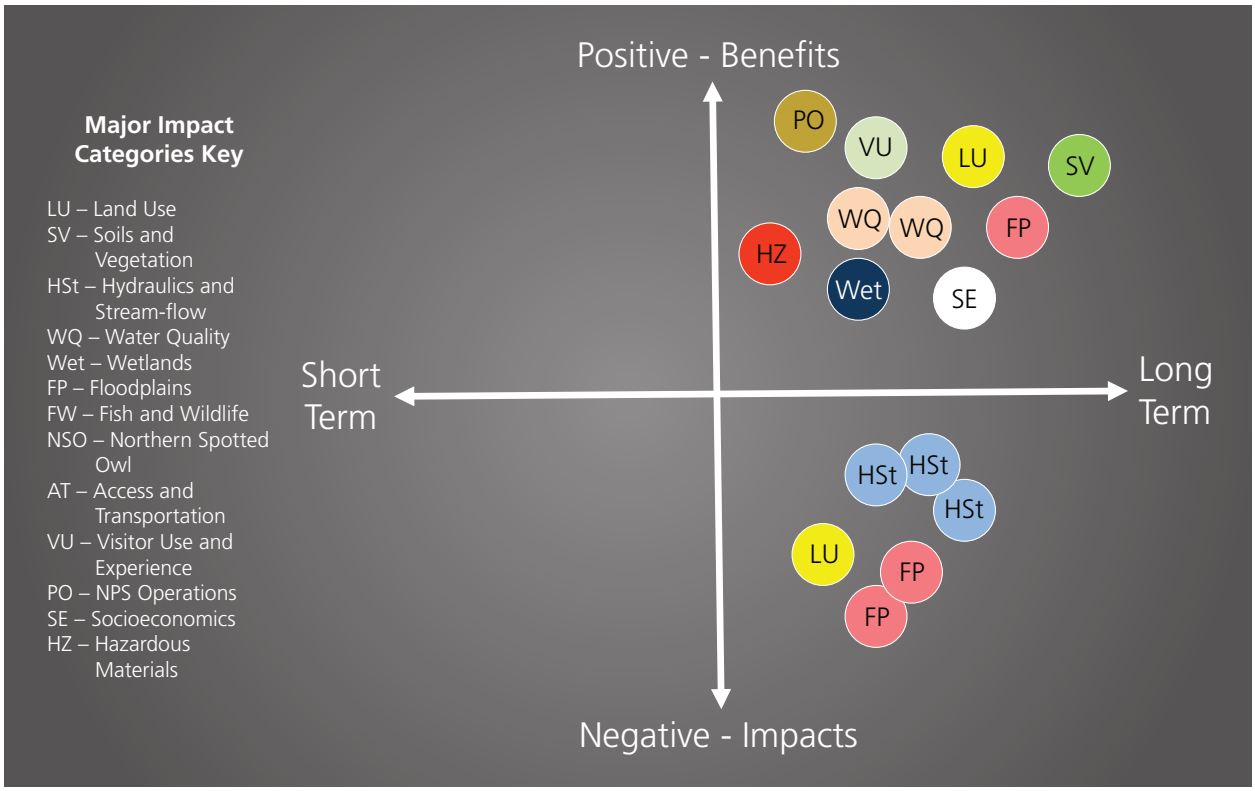
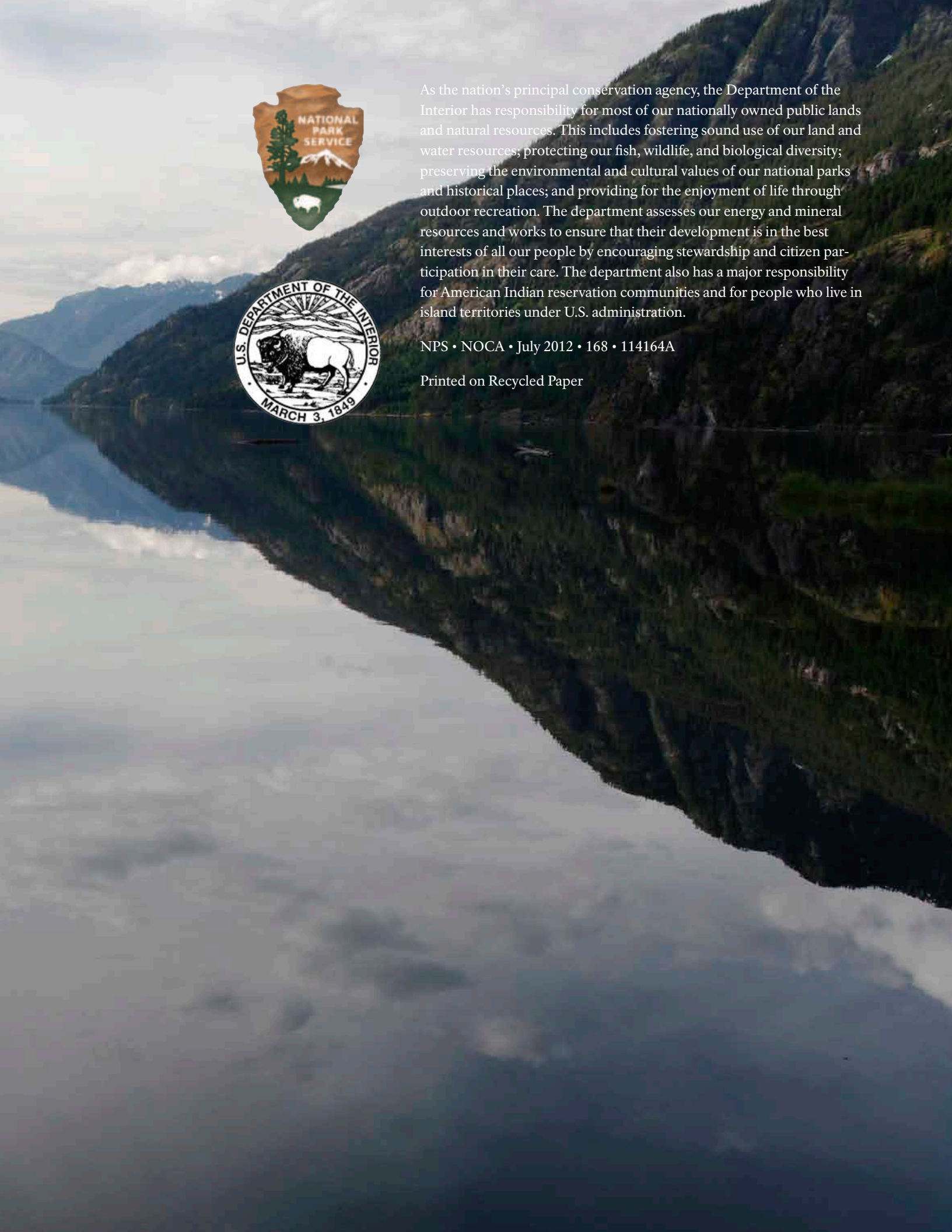


Figure 13: SRCIP Major Beneficial and Adverse Impacts Alternatives 1 and 4



Alternatives 2, 3 and 5 would have similar cumulative impacts on river processes, but in Alternative 3 large engineered logjams 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 9.2%. 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, but less than, Alternative 4.



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

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