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# Environmental Assessment

## Harris River Watershed Rehabilitation

**Craig Ranger District, Tongass National Forest**
**Prince of Wales Island, Alaska**

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# DESCRIPTION OF THE PROJECT AREA

The Harris River is located on Prince of Wales Island in the Alexander Archipelago of Southeast Alaska (Map 1). The Harris River flows southeast to Harris River Bay near the town of Hollis. The 19,009 acre drainage basin was shaped primarily by glacial carving and resulted in two smaller sub-basins flowing to a main valley. The Harris River has been divided into three sub-basins: Upper Harris River; Fubar Creek; and Lower Harris River. State land occupies 1,974 acres of the lower channel and estuary. Encumbered land totals 3,172 acres in the Upper Harris River and Fubar Creek sub-basin. This land has been selected by the State of Alaska and native corporations for conveyance of ownership. (Map 2).

High precipitation is a driving natural process in Southeast Alaska. The sea level Hollis rain gage collects on average 105 inches of precipitation per year. The steep valley slopes with moderate to shallow soils over bedrock make for rapid and efficient transport of water to streams. Heavy vegetation and undergrowth in natural conditions protect soil resources from erosion processes.

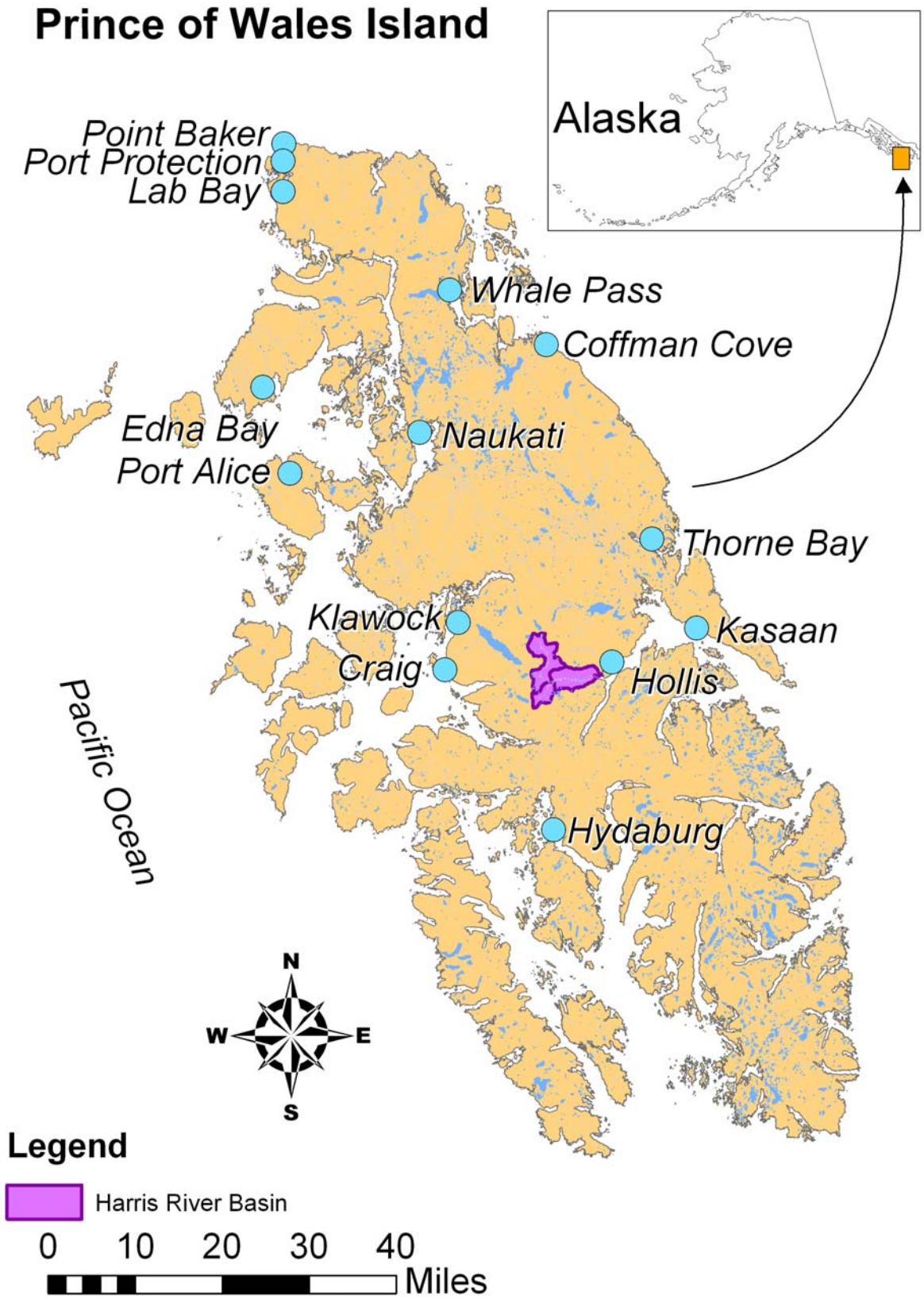
Resource impacts from past management activities and intense natural processes were the primary reason for developing a Watershed Restoration Plan (WRP) in 2006. The WRP assessed the existing condition of the watershed and analyzed the impact of human induced stressors, such as timber harvest and road construction in ecologically sensitive areas, to then identify and prioritize rehabilitation projects.

No near future timber management activities are currently planned. Commercial thinning opportunities may become viable in a 5-20 year timeframe. Commercial harvest of mature second growth conifers in the basin may become viable in a 40-60 year timeframe.

Multiple discrete access points to the mainstem channel and Upper Harris basin provide opportunity for a variety of recreation and subsistence use. The Harris River Campground and Day Use Area located on paved highway is situated 10 miles from the Hollis Ferry Terminal and 20 miles from the Craig/ Klawock area. Restrooms, potable water, garbage service and campground host are available. The campground was newly constructed in 1998 to accessibility standards.

The Maybeso Experimental Forest borders the Harris River Watershed to the North. The Karta Wilderness Area borders the headwaters of the Upper Harris River. Projects proposed in this EA are limited to the Harris River Watershed and will not influence or affect any resources in the Maybeso River basin.

Map 1: Prince of Wales Island, Harris River Watershed General Location Map



# PROPOSED ACTION

The Craig Ranger District is proposing to complete riparian thinning, road storage, floodplain roughening, and instream channel rehabilitation projects in the Harris River Watershed (Map 1 and Table 1) in response to the Purpose and Need for action detailed in this Environmental Assessment (EA) (see page 4). The Purpose and Need responds to recommendations in Harris River Watershed Restoration Plan (HRWRP) completed in late 2006. The Harris River has been divided into three sub-basins: Upper Harris River; Fubar Creek; and Lower Harris River. While addressing watershed impacts, projects are also designed to improve visitor access and interpretation would provide the public a greater appreciation, education, and ownership of the forest and aquatic ecosystems.

The Forest Service proposes to implement rehabilitation projects with the goal of restoring sustainable ecological functions in the Harris River Watershed (Table 1, Table 2, and Appendix A of individual detailed project descriptions). Detailed project descriptions may be found in Appendix A. The proposed rehabilitation projects vary in scope, scale, and spatial influence. The projects would be timed to maximize, watershed recovery, project efficiency, and interdisciplinary goals while minimizing risk to existing resources. Whether the projects are large or small engineered projects with persistent long-term rehabilitation goals or short-term low cost projects, all proposed projects meet the basin rehabilitation strategy documented in the Harris River Watershed Restoration Plan document.

The Harris River Rehabilitation EA outlines the projects and suggests how they may be sequenced or prioritized such that overall basin rehabilitation will be most effective. The primary objectives for rehabilitation projects in the Harris River focus on reducing sedimentation from headwater tributaries to lower floodplain reaches, promoting healthy and stable fish and wildlife populations, while improving visitor access and interpretation opportunities. This would be accomplished through elimination of artificial fish barriers, reduction of and fill failure erosion potential from roads, promotion of instream processes that develop healthy fish habitat, reduction of stream bank erosion and diversion potential, improvement of hydrologic connectivity, wildlife emphasis thinning, and trail improvements. Projects proposed on or utilizing State property will require additional partnership development and agreements.

## Timing of Project Action

Timing of the proposed action is critical to project implementation as work in streams is limited to seasonal windows because of fish emergence, fish return and weather. These windows must be used to implement in stream work between the periods when smolt emerge from last years spawn and the return of the present years adult spawning fish. These windows are different for each species so they correspond to a sequencing dependant upon fish presence in each stream.

| | |
|---|---|
| Pink/chum salmon | June 1 to August 3 |
| Coho salmon | June 15 to September 1 |
| Sockeye salmon | July 18 to August 15 |
| Steelhead | July18 to August 15 |
| Cutthroat trout | June 25 to September 1 |
| Dolly Varden char | June 15 to September |

Note that the type of project sequencing is dependent upon whether the project *directly* or *indirectly* affects watershed processes, watershed management goals, and fish timing windows. Projects that directly affect watershed processes should be carefully applied in specific sequence such that impacts upstream are addressed first to ensure that sources of resource damage are addressed and to improve the chance of project successes downstream. Examples of projects that directly affect watershed processes include any instream work, projects that alter flow or immediately change sediment input or transport capabilities. Projects that indirectly affect watershed processes may be applied across the watershed independent of other project sequencing and may be guided under a different priority system that may include resource stresses, public access/interaction, and available funding. Examples of more indirect projects may include isolated treatment sites or long-term goal projects such as road storage, landslide stabilization, instream tributary large wood, or riparian thinning. Both direct and indirect projects will be critical to overall watershed rehabilitation for spatial, temporal, and economic beneficial effects.

The watershed rehabilitation projects proposed in this Environmental Assessment have the potential to provide jobs and help stimulate the local economy.

Table 1. Proposed Harris River Watershed Rehabilitation Action

**Harris River Watershed Restoration Proposed Project List From Harris River Restoration Plan**

| Project Name | Sub-Basin | Ownership | Landscape Position | Project Type | Watershed Processes | Relative Priority | Length, Miles |
|---|---|---|---|---|---|---|---|
| Fubar Creek Instream Rehabilitation Phase II | Fubar Creek | Federal | Riparian | Instream | Hydro | High | 0.5 |
| 2024050 (South) Decommission/Fubar Creek Trail Designation & Improvement | Fubar Creek | Federal | Riparian | Recreation | Hydro | High | 0.7 |
| 2026000 & 2026200 Decom/Storage | Upper Harris River | Federal | Upper-Slope | Road | Hydro/Landslide | High | 2.1 |
| 2000220 Road Storage | Fubar Creek | Federal | Headwater | Road | Hydro/Landslide | High | 0.6 |
| 2024110 Decommission & Hydrologic Connectivity Restoration | Lower Harris River | Federal | Low-Slope | Road | Hydro | Med-High | 1.5 |
| 2024050 (North) Harris River Trail Upgrade/Stream Rehabilitation | Lower Harris River | Federal | Tributary | Instream/Recreation | Hydro/Instream | High | 1.4 |
| 2025100 Road Storage | Upper Harris River | Federal | Mid-Slope | Road | Hydro/Landslide | High | 0.8 |
| 2025000_RR1 Improvement Hydrologic Connectivity Restoration | Upper Harris River | Federal | Mid-Slope | Road | Hydro/Landslide | Low-Med | 1.8 |
| 2025000_RR2 Trail Improvement & Stream Bank Stabilization | Upper Harris River | Federal | Low-Slope | Instream/Recreation | Hydro | Med | 2.8 |
| Upper Harris River Mainstem LWD Structure-Sediment Routing | Basinwide | Federal | Riparian | Riparian | Riparian | High | 1.0 |
| 2024100_RR1 State Trail Improvement | Lower Harris River | State | Low-Slope | Road Hyrologic Connectivity | Hydro | Med-High | 1.0 |
| Tributary LWD Modifications and Enhancements | Basinwide | Federal | Low-Riparian | Instream | Hydro | High | 2.0 |
| Riparian Thinning & Floodplain Roughening | Basinwide | Federal | Riparian | Riparian | Riparian | High | -- |
| Lower Harris River Mainstem LWD Structure-Bank Stabilization | Basinwide | Federal | Riparian | Instream | Hydro | High | 2.0 |
| 2024185 Road Storage | Lower Harris River | Federal/State | Mid-Slope | Road | Hydro/Landslide | Med | 2.2 |
| 2024060_0.048L Road Storage | Lower Harris River | Federal | Mid-Slope | Road | Hydro | Med | 1.6 |
| 2024080_Harris Peak Road Storage | Lower Harris River | Federal | Mid-Slope | Road | Hydro/Landslide | Med-High | 1.4 |
| 2024080_0.06R&RA State Road Storage | Lower Harris River | State | Low-Slope | Road | Hydro/Landslide | High | 0.3 |
| Harris River Red Pipe Correction | All | Both | Low-Slope | Road/Instream | Biological | Low-Med | -- |
| 924_25.94R State Road Storage | Lower Harris River | State | Low-Slope | Road | Hydro | High | 0.2 |

| Treament Summary (estimated quantities) | | | | Overall Proposed Accomplishment | |
|---|---|---|---|---|---|
| Culverts removed = | 53 | Fill imported, cy = | 40 | Road Storage/Stormproofing, mi = | 9.2 |
| New culverts installed = | 20 | Outslope/Reshape road, ft = | 2,432 | Road Hydrologic Connectivity Restoration, mi = | 3.4 |
| Culverts replaced = | 1 | Clean IBD, ft = | 1,370 | Trail Improvement, mi = | 3.8 |
| Waterbars installed = | 113 | New ditch relief culverts installed = | 2 | Instream Rehabilitation, mi = | 5.5 |
| Cross road drains = | 80 | Rolling dips installed = | 14 | Riparian Rahabilitation, ac = | 20.0 |
| Excavated fill, cy = | 43,020 | Grade control structures installed = | 1 | | |
| Log bridges removed = | 3 | Rip Rap, sq ft = | 440 | | |
| Log culverts removed = | 31 | Fish passage culverts replaced = | 6 | | |
| Re-establish channels at crossings, ft = | 130 | | | | |

Table 2 Harris River Red Pipe(blocked upstream habitat for fish) Descriptions.

| RTE_NO | Mile Post | Channel Type | % Inlet Blocked or Damaged | Pipe Width, in | Pipe Length, ft | Habitat Length, ft | Site Description |
|---|---|---|---|---|---|---|---|
| 2000240 | 0.057 | MM_MM | 0 | 24 | 30 | 71 | Class 2_2 stream crossing with a 24" perched plastic pipe. Site is located in the Harris River campground and will need to be addressed as an individual project. ***No immediate treatment is recommended due to limited upstream habitat.*** |
| 2024100 | 0.976 | PA5_PA5 | 99 | -- | 2 | 560 | Class 1_1 stream crossing with a log culvert located on State land and is part of the Indian Creek Trail in the lower Harris basin across the Harris River footbridge. Beaver activity up and downstream. Culvert is packed with sediment and debris. Coho found downstream. Assess for hand crew removal of sediment and debris as heavy equipment is not an option. Only other option will be to blast and construct a bridge. |
| 2025000 | 1.7 | | 100 | 30 | 24 | 413 | Class 2_2 stream crossing with a 30" wood culvert. Site is located on drivable portion of access road to the Twentymile Trailhead. Beaver activity upstream. Moderate to intensive hand labor can correct problem, but may be addressed as general road improvement project. Debris blocks fish passage. Install 48 inch pipe and clear pipe inlet area. |
| 2025000 | 1.86 | MM_MM | 0 | 24 | -- | 60 | Class 2_2 stream crossing with a 24 inch CMP on Twentymile Trail at intersection with the 2025100 road. Sixty feet of upstream habitat is the inboard ditch of road/trail. ***No immediate treatment is recommended*****,** but may be addressed in either trail improvement or 2025100 road storage projects. |
| 2025000 | 3.187 | PA5_PA5 | 90 | 9 | -- | 409 | Class 2_2 stream crossing on the Twentymile Trail. Drainage structure has been removed, however, beaver activity upstream and downstream have dammed the crossing and backwatered the stream onto road surface. ***Treatment of the site may be addressed as part of the Twentymile Trail improvement project.*** |
| 2026000 | 0.23 | HC_HC | 100 | 18 | 29 | 125 | Class 2_2 stream crossing with an 18" CMP on the "Summit" Road in the Upper Harris River. The upstream 125 feet of habitat is the inboard ditch. No fish found upstream. Water is piping through road prism. Habitat upstream and downstream is marginal. ***No immediate treatment is recommended.*** |

# PURPOSE AND NEED FOR ACTION

Cumulative effects resulting from past management activity have contributed to altered watershed processes in the basin (McGreer, 2000; Swanston, 1991; Jones, 2000, Lassettre, 2001). These watershed processes often lead to decreased wildlife and instream fish habitat (Shapely, 1965; James, 1965; Lassettre, 2001). past management effects have altered floodplain processes, hydrologic connectivity in streams, sediment delivery and timing in streams, sedimentation to stream beds, and the resulting impacts to fish and wildlife habitat has decreased (Map 2 in Appendix C). Because an interdisciplinary team has identified this underlying need for project action in the Harris River Watershed, the Proposed Action in this Environmental Assessment has targeted resource concerns (undesired conditions) resulting from past timber harvest of upslope and riparian areas, road construction, natural disturbance, and elevated public use. The proposed projects (Table 1) are intended to rehabilitate the potential ecological function within the Harris River Watershed. The range of rehabilitation needs are fully described in Appendix A, under the heading of Reach Overview for each project in this Proposed Action. Map 3 and Map 4 in Appendix C shows the location of each of these projects. An opportunity also exists for improving the visitor experience through trail improvement and interpretation.

The Forest Service is proposing this Watershed Rehabilitation in order to reduce sediment delivery, improve channel stability and improve aquatic habitat within the Harris River Watershed. The proposed action in the Harris River Watershed Rehabilitation Project Area is based on the Forest Plan and the difference between the existing and desired conditions in the project area. It responds to the goals and objectives outlined in the Forest Plan.

## Forest Plan Goals and Objectives

The Forest Plan includes Forest-wide multiple–use goals. Incorporated here by reference, these goals include, but are not limited to the following (see Tongass Forest Plan, pages. 2-2 to 2-5):

### Wildlife

Design and implement non-structural wildlife habitat improvement projects. Include a young-growth management program to maintain, prolong, and/or improve understory forage production and to increase future old-growth characteristics in young-growth stands.

### Fish

Maintain or restore aquatic habitat conditions to sustain the diversity and production of fish and other freshwater organisms.

### Biodiversity

Maintain healthy forest ecosystems; maintain a mix of habitats at different spatial scales; capable of supporting the full range of naturally occurring flora, fauna, and ecological processes native to Southeast Alaska.

### Soil and Water

Minimize sediment transported to streams from land-disturbing activities. Perform watershed restoration projects. Maintain and restore the biological, physical, and chemical integrity of Tongass National Forest waters.

### Transportation

Develop and manage roads to support resource management activities. Manage and maintain roads to protect water, soil, fish, and wildlife resources.

### Local and Regional Economy

Provide a diversity of opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska. Support a wide range of natural-resource employment opportunities within Southeast Alaska's communities.

## Standards and Guidelines - Desired Condition

Additionally, the Harris River Watershed Rehabilitation Project helps move the project area towards the desired conditions as described in the Forest Plan (Forest-wide Standards and Guides pages 4-8:10, 4-53, 4-120) incorporated by reference, and highlighted here:

- Maintain or restore the natural range and frequency of aquatic habitat conditions on the Tongass National Forest to sustain the diversity and production of fish and other aquatic organisms.
- Maintain or restore optimum water temperatures for salmonids, considering both winter and summer habitat requirements, climate, and natural watershed characteristics.
- Maintain or restore the natural range and frequency of aquatic habitat conditions on the Tongass National Forest to sustain the diversity and production of fish and other freshwater organisms
- Maintain or restore water quality to provide for fish production
- Maintain or restore natural and beneficial quantities of Large Woody Debris over the short and long term
- Maintain or restore stream banks and stream channel processes and manage riparian areas for short and long-term biodiversity and productivity
- Maintain fish passage through stream crossing structures
- Operate and maintain Forest Development Roads in a manner which meets the road management objectives and ecological objectives for the landscape where the road is located. Use road closures, maintenance and other measures to keep road surface and road site erosion at low or near background levels. Maintain roads to meet Best Management Practices (BMP's) regardless of the methods used to obtain the maintenance work. Manage roads to provide cost-effective support to Land Use Designation objectives and safe travel to users of the system, while protecting the environment, adjacent resources, and the public investment.
- Continue a young-growth management program to maintain, prolong, and/or improve understory forage production and to increase future old growth characteristics in young-growth timber stands for wildlife (deer, black bear, and other species)

In regard to fish habitat improvement planning, the Forest Plan specifies:

- Improve or restore fish habitat and population objectives of the Forest Plan.

For wildlife improvement planning, the Forest Plan specifies:

- Identify habitat improvement projects to meet wildlife habitat and population objectives.

- Use silvicultural practices, where applicable, to accomplish widlife habitat objectives.

The purpose of this Environmental Assessment (EA) is to implement Goals and Objectives of the Forest Plan and Standards and Guides as identified in the Proposed Action.

The EA will describe the environmental impacts of proposed rehabilitation projects to comply with the procedural requirements of NEPA regulations. Analysis and public comment of the EA will be used to determine a Finding of No Significant Impact (FONSI) or initiate preparation an Environmental Impact Statement (EIS). If the EA indicates that the proposed action constistutes a major federal action significantly affecting the quality of the human environment, then an EIS will be required.

Detailed background and conditions relating to historic use and watershed processes in the Harris River is presented in the Environment and Effects section of this document.

# ALTERNATIVES

This chapter describes and compares the alternatives considered for the Harris River Rehabilitation project. Maps of each alternative considered are located in Appendix C. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. This environmental assessment will compare the impacts of the no action alternative to the proposed basin-wide restoration activities.

## Alternative Development

Two alternatives have been developed to address issues and meet the purpose and need of this project: Alternative 1 — No Action and Alternative 2 — Proposed Action. No alternatives to the Proposed Action were identified that would meet the purpose and need of the project and have meaningful differences in environmental effects. Due to fish timing windows (see Timing of Project Action), the sequence of project implementation of the proposed action meets a reasonable range of alternatives. Therefore, this EA will analyze the effects of the "Proposed Action" and the "No Action Alternative".

Public participation in the NEPA process has been, and will continue to be, solicited and welcomed. Compliance with state and federal laws and regulations, as well as Best Management Practices and Standards and Guidelines in the Forest Plan will be carried out as detailed.

Based upon the effects of the alternatives, the responsible official will decide whether or not to authorize projects developed to address the goals and objectives stated herein and further presented in this document. The decision will enable managers to seek funding and contract work to complete individual projects. The decision will formally commit the Forest Service to the long-term goal of holistic watershed rehabilitation in the Harris River.

## Alternatives Considered but Not Analyzed in Detail

An alternative approach to watershed rehabilitation was considered based on case by case basis through sporadic projects responding to natural processes over time rather than the integrated method in the proposed action. A determination was made that such an approach would not meet

the underlying need for action in the project area; this determination is discussed in the proposed action section of this document under Project Timing.

## Alternative 1: No Action

Under the No Action alternative, current management policies with regard to National Environmental Policy Act (NEPA) compliance would continue, providing compliance on a project by project basis requiring independent analysis for each project. Individual project type, size and number would be expected to remain unchanged. Overall ecological function would be less than the optimal potential for this watershed since it would not be addressed holistically.

The environmental impacts of the individual projects would likely be the same as similar projects conducted under a large scale EA. The primary difference would be that the amount of time dedicated towards completing the NEPA process for individual projects would remain high, especially when compared with a large scale approach, resulting in decreasing administrative efficiency. The ability to analyze the cumulative effects of these projects would be diminished. Map 2 (Appendix C) shows all harvest units, highlights harvested riparian areas, and landslide activity in the basin.

## Alternative 2: Proposed Action

The second alternative is the Proposed Alternative. Through a comprehensive program of ecosystem rehabilitation, promoting projects in both riparian areas and in upland habitats, the Proposed Alternative would meet or exceed the Purpose and Need. This alternative would address disrupted watershed processes for short and long-term health of aquatic and terrestrial ecosystems. Watershed improvement activities in the Proposed Action (Table 1, Table 2, and Appendix A) would address undesired watershed processes through controlling sediment sources and reducing sites with active or high potential for erosion, controlling active stream diversions or high potential for stream diversion. Roads with high potential for fill failure, culvert failure, and hydrologic connectivity would be addressed with the Proposed Action. Hydrologic connectivity is essential to the ecological integrity of the landscape, and altering this property can have major negative environmental effects. Some of the effects of the actions would be immediate and localized. For example, with respect to migratory fish, a stream diversion caused by a plugged pipe or a stream purposely diverted to another drainage may act to reduce hydrologic connectivity (by preventing or impeding migration up or downstream). Projects would also address plugged or diverted streams at road crossings. Culverts on fish streams that do not allow fish migration are termed “Red” pipes. Six Red pipes are listed in the Harris River Basin (Table 2). While reducing sedimentation in the watershed through restoration projects, we also intend to actively improve fish habitat by increasing channel complexity using large wood inputs into selected stream reaches.

Best Management Practices and Forest Plan Standards and Guidelines would be utilized to ensure that these projects minimize any potential adverse impacts to the environment. During the evaluation and approval process for each project, separate clearance procedures required by the Clean Water Act and National Historic Preservation Act (NHPA) will be undertaken, in consultation with the Army Corps of Engineers specialists and the State Historic Preservation

Office, respectively. All state and federal regulations and permits will be acquired as necessary and appropriate.

A large scale rehabilitation approach to analyze the effects of this project allows for a comprehensive, ecosystem wide evaluation of the proposed rehabilitation activities, recognizing the connection and inherent relationship between differing segments of the environment. A large scale approach also provides for more efficient paperwork processing for these projects, since individual NEPA assessments will not be necessary under this alternative.

Projects proposed in this alternative can be grouped into one or more broad categories as listed below :

- Road or Trail Projects: Road storage and decommissioning; road drainage improvements and storm proofing; road cut and fillslope stabilization (Map 3); culvert/stream crossing upgrades including "Red" (Table 3) fish crossing pipes, improving hydrologic connectivity, and designating new trail.
- Riparian Projects – erosion control; wildlife and riparian habitat improvement; improved floodplain function (Map 4).
- Instream projects – habitat complexity and diversity improvements; floodplain function improvements; hydrologic regime improvements; bank stabilization; coarse woody debris supplementation; artificial fish passage barrier removals
- Recreation Projects - Visitor access improvements and additional interpretation and education opportunities.

Appendix A lists all projects with project descriptions that explains all actions.

Some short-term negative impacts could occur because of the projects authorized by Alternative 2, but these would be offset by the expected long-term beneficial results to water quality and habitat conditions. Alternative 2 is not expected to have a significant impact when compared to the loss of riparian, wetland, and upland habitat functionality that has occurred in the watershed to date. Impacts that do occur would be of a cumulatively beneficial nature.

## Decision Framework

This EA is not a decision document. It is a document disclosing the environmental consequences of implementing the different alternatives, including the No Action alternative. After completion of the EA, there will be a 30-day public review and comment period. Following the public comment period, a decision will be made. Based on the information in the analysis and a consideration of the public comments, the Deciding Officer will document the decision in a Record of Decision.

The responsible Federal official is the Craig District Ranger. The decision will consider whether or not to implement proposed watershed rehabilitation projects to the Harris River Basin, and if so, what areas to treat, and what treatment methods and monitoring would be implemented.

- This includes whether or not to:
    1. Put Road 2000220 into storage with the use of heavy equipment to reduce high failure potential and protect Fubar Creek Rehabilitation investment.

2. Improve Harris River Trail (2024050 North) by relocating section of trail and rehabilitating an anadromous stream segment impacted by the trail and highway.
3. Decommission closed road 2024050 (South) and designate and improve as Fubar Creek Trail.
4. Apply storage treatments to non-system Road 2024060_0.048L.
5. Apply storage treatments to non-system Road 2024080_Harris Peak.
6. Work with the State to apply closure treatments to non-system State road 2024080_0.06R&RA.
7. Work with the State to apply closure treatments to non-system State Road 924_25.94.
8. Work with the State to improve trail access to the State owned Harris-Indian Creek estuary (2024100_RR1).
9. Decommission - Restore hydrologic connectivity and drainage on the system Road 2024110.
10. Apply storage treatments to non-drivable system Road 2024185.
11. Improve road by restore hydrologic connectivity and drainage, and resurface drivable system portion of the Road 2025000.
12. Improve the Twenty-Mile Trail by improving drainage and hydrologic connectivity, upgrading stream crossings, and addressing stream/road interactions.
13. Apply storage treatments to non-drivable system closed portion Road 2025100.
14. Apply decommission and storage treatments to portions of system Road 2026000 and 2026200 respectively.
15. Provide tributary large wood modifications and enhancements.
16. Proceed with Fubar Creek rehabilitation phase II; ~0.5 miles instream rehabilitation from mainstem confluence upstream.
17. Plan and implement Harris River mainstem bank stabilization, floodplain roughening, manage stream diversions, sediment routing, and riparian zone protection using large woody debris and heavy equipment.
18. Continue to plan and implement mainstem and tributary riparian thinning.

## Agencies and Persons Consulted

The project proposal has been listed on the Tongass National Forest Schedule of Proposed Actions since October 1, 2006. This document is available on the internet. A scoping letter was sent on January 5, 2007 to approximately 60 individuals, organizations and federal and state agencies that had previously shown interest in USDA Forest Service projects within the vicinity of Prince of Wales Island, Alaska, summarizing the purpose of the project and soliciting comments. Two responses to this mailing were received. Using the comments from the public, other agencies, and tribal organizations above (see *Issues* section), the interdisciplinary team developed a list of issues to address.

This EA will be advertised in the *Ketchikan Daily News* and *The Island News*; and the EA will be made available for a 30 day comment period, after which a decision will be made by the Forest Service. Copies of the mailing list, scoping letter, and any correspondence received regarding this EA will be available at the Craig Ranger District.

## Tribal Consultation

As part of ongoing government to government tribal relations and collaborative management of resources on Prince of Wales Island, the Craig Community Association (CCA), Klawock Cooperative Association (KCA), Hydaburg Cooperative Association (HCA), and the Organized Village of Kasaan (OVK) were provided an overview of District projects including this project in writing on December 15, 2006 as well as during tribal consultation meetings, attended by the District Ranger or his representative, which took place with CCA on January 24, 2007, and with KCA and HCA on January 9, 2007.

## Issues

The Forest Service separated the project issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

Non-significant issues may be found in the project record. One of the two issues from the two responses was regarding acquisition of appropriate State Department of Natural Resources permits. Law and regulation already require this. The second comment was asking the type of monitoring we were to undertake and offered assistance to that end. This is irrelevant to the decision as it simply requested information and offered assistance. An issue which maybe considered key to this project is sediment produced during project implementation; the relevancy of this topic is discussed thoroughly in this document.

No significant issues, were raised during scoping by the public.

## Federal and State Permits, Licenses, and Certificates

To proceed with the projects as addressed in Alternative 2 in this EA, various permits, licenses, or certifications will be obtained from federal and state agencies. The following permits would be obtained for the reconstruction and use of the area:

- Approval of discharge of dredged or fill material into the waters of the United States under Section 404 of the Clean Water Act from the U.S. Army Corps of Engineers

- Certification of compliance with Alaska Water Quality Standards (Section 401 Certification) from the State of Alaska, Department of Environmental Conservation.
- Title 41 concurrence for instream work from the State of Alaska, Department of Natural Resources Office of Project Management and Permitting

In addition to the above permits, the Forest Service is required to obtain concurrence from the State of Alaska, Office of Project Management & Permitting (in the Department of Natural Resources) on a coastal zone consistency determination to proceed with the proposed action.

# Mitigation and Monitoring Common to All Alternatives

Mitigation measures necessary for this project would implement Forest Plan Standards and Guidelines and the Alaska Region Best Management Practices (BMPs). See the Forest Service's Soil and Water Conservation Handbook (FSH 2509.22) for Best Management Practices and Forest Plan Standards and Guidelines to be used during project implementation. FSH 2509.22 may be found at http://www.fs.fed.us/r10/ro/policy-reports/bmp/index.shtml. Information and documents regarding the Tongass Land and Resource Management Plan may be accessed at http://www.fs.fed.us/r10/tongass/projects/tlmp/index.shtml. Monitoring of BMPs on the Tongass demonstrates that BMPs are effective at maintaining Alaska Water Quality Standards for suspended sediments and turbidity (USDA Forest Service 2002).

The Forest Service must apply BMPs that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2000). In 1997, the State approved the BMPs in the Forest Service's Soil and Water Conservation Handbook (FSH 2509.22), October 1996) as consistent with the Alaska Forest Resources and Practices Regulations. This Handbook is incorporated into the Tongass Land Management Plan.

# Applicable Laws and Executive Orders

Many federal laws and Executive Orders pertain to project-specific planning and environmental analysis on federal lands. While most of the laws and Executive Orders listed below pertain to all federal lands, some of the laws are specific to Alaska.

## Findings and Disclosures

Several of the laws and executive orders listed below require project-specific findings or other disclosures. These apply to federal land management projects and activities and are included here and in any future Decision Notice. They apply to both alternatives considered in detail in this EA.

**National Forest Management Act**
All project alternatives fully comply with the 1997 Tongass Forest Plan. This project incorporates all applicable Forest Plan standards and guidelines and management area

prescriptions as they apply to the project area and complies with Forest Plan goals and objectives. This includes the additional direction contained in the 1997 Record of Decision for the Forest Plan Revision. All required interagency review and coordination has been completed.

The 1997 Forest Plan complies with all resource integration and management requirements of 36 CFR 219 (219.14 through 219.27). Application of Forest Plan direction for Harris River Watershed Rehabilitation ensures compliance at the project level.

**Endangered Species Act**
None of the alternatives is anticipated to have a direct, indirect, or cumulative effect on any threatened or endangered species in or outside the project area. A complete Biological Evaluation (BE) is included in the planning record.

**National Historic Preservation Act**
Section 106 of the NHPA requires consideration of the effects of proposed action on cultural resources in the area of potential effects for the undertaking. The Alaska Region of the Forest Service, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation Programmatic Agreement (Agreement # 02MU-111011-176) establishes the National Historic Preservation Act Section 106 review process for certain types of projects. For Projects that are found to contain no historic properties within the area of potential effects, the Forest Service may authorize project clearance after completing and documenting the analysis process. Under the terms of the Programmatic Agreement completed reports are forwarded to the SHPO annually for programmatic review. Many actions proposed in this EA have little or no potential to affect heritage resources and may be cleared under the terms of the PA. Other will require project-specific section 106 clearance. Tribal governments and Alaska Native Corporations have been consulted. No effects on known cultural resources are anticipated.

**Federal Cave Resource Protection Act**
No known significant caves in the project area would be directly or indirectly affected by project activities. Forest Plan karst and caves standards and guidelines are applied to areas known or suspected to contain karst resources.

**Alaska National Interest Lands Conservation Act (ANILCA)**
An ANILCA Section 810 subsistence evaluation was conducted. No significant restrictions on the abundance and distribution of, access to, or competition for subsistence resources in the project area are anticipated.

**Clean Water Act**
Congress intended the Clean Water Act of 1972 (Public Law 92-500) as amended in 1977 (Public Law 95-217) and 1987 (Public Law 100-4) to protect and improve the quality of water resources and maintain their beneficial uses. Section 313 of the Clean Water Act and Executive Order 12088 of January 23, 1987 address Federal agency compliance and consistency with water pollution control mandates. Agencies must be consistent with requirements that apply to "any governmental entity" or private person. Compliance is to be in line with "all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution."

The Clean Water Act (Sections 208 and 319) recognized the need for control strategies for nonpoint source pollution. The National Nonpoint Source Policy (December 12, 1984), the Forest Service Nonpoint Strategy (January 29, 1985), and the USDA Nonpoint Source Water Quality Policy (December 5, 1986) provide a protection and improvement emphasis for soil and

water resources and water-related beneficial uses. Soil and water conservation practices (BMPs) were recognized as the primary control mechanisms for nonpoint source pollution on National Forest System lands. The Environmental Protection Agency supports this perspective in their guidance, "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987).

The Forest Service must apply Best Management Practices that are consistent with the Alaska Forest Resources and Practices Regulations to achieve Alaska Water Quality Standards. The site-specific application of BMPs, with a monitoring and feedback mechanism, is the approved strategy for controlling nonpoint source pollution as defined by Alaska's Nonpoint Source Pollution Control Strategy (October 2000). In 1997, The State approved the BMPs in the Forest Service's Soil and Water Conservation Handbook (FSH Handbook 2509.22, October 1996) as consistent with the Alaska Forest Resources and Practices Regulations. This Handbook is incorporated into the Tongass Land Management Plan.

Temporary access roads for instream project work as well as fill placed in waters including wetlands requires U.S. Army Corps of Engineers regulatory approval. The Corps of Engineers wetland permit review under Section 404(f) of the Clean Water Act will be mandatory for this project. Detailed project descriptions will be provided to Corps of Engineers standards that will quantify the amount of wetlands affected prior to implementation. The FS standard is to avoid wetlands if possible, and if not able to avoid, to minimize the effects to wetlands considering it has values and functions.

**Clean Air Act**

Emissions anticipated from the implementation of any project alternative would be of short duration and are not expected to exceed State of Alaska ambient air quality standards (18 AAC 50).

**Coastal Zone Management Act**

Under the Coastal Zone Management Act (CZMA) of 1972, as amended, FS activities and development projects that affect the coastal zone must be consistent to the maximum extent practicable with the enforceable policies of the Alaska Coastal Management Program (ACMP). Such "consistency determinations" are made by the FS, and are reviewed by the State of Alaska as required by the CZMA.

**Alaska Coastal Zone Management (ACMP)**

The FS has determined that the Harris River Watershed Rehabilitation project has limited, indirect effects on the coastal zone, and that the Forest Plan's standards and guidelines and mitigation measures applicable to proposed projects presented in this EA meet or exceed the requirements of the State of Alaska Forest Resources and Practices Act. Therefore, the project is consistent to the maximum extent practicable with the enforceable policies of the Alaska Coastal Management Program. Copies of this determination and supporting information will be provided to the State of Alaska, Department of Program Management and Permitting, for review as required by the CZMA.

**Executive Order 11988**

The numerous streams in the Harris River Watershed Rehabilitation project area make it essentially impossible to avoid all floodplains during project work, primarily instream project access. Temporary access roads may be constructed (or reconstructed) in or through riparian areas subject to the design requirements of the Best Management Practices. Effects on these riparian areas from project activities have been avoided or minimized as much as possible.

**Executive Order 11990**
Executive Order 11990 requires federal agencies to avoid, to the extent possible, the long-term and short-term adverse impacts associated with the destruction or modification of wetlands.

The FS standard is to avoid wetlands if possible, and if not able to avoid, to minimize the effects to wetlands considering its values and functions. Wetlands are extensive in the Harris River Watershed Rehabilitation project area; therefore it is not feasible to avoid all wetland areas. A small portion of wetlands will be impacted due to temporary access trails to instream project sites, however no adverse effects to overall wetland function and condition are anticipated due to their relatively small size and through the use of Best Management Practices to reduce impacts.

**Executive Order 12898**
Implementation of any project alternative is not anticipated to cause disproportionate adverse human health or environmental effects to minority or low-income populations. Expected effects are similar for all populations, regardless of nationality, gender, race , or income.

**Executive Order 12962 (Aquatic Systems and Recreational Fishing)**

This executive order was signed on June 7, 1995 and addresses recreational fishing in the United States. It requires federal agencies to protect and promote recreational fishing opportunities and to work with anglers to encourage conservation and protection of fish habitat. The potential impacts of the Harris River Rehabilitation on on Essential Fish habitat have been evaluated and are discussed in the Fisheries section. Proposed activities are anticipated to have no adverse effect on Essential Fish Habitat. NMFS review is pending.

With the application of Forest Plan Standards and Guidelines, including those for riparian areas, no significant adverse effects to freshwater resources are anticipated to occur. Recreational fishing access would be improved through trail creation and improvements. Fish resources should improve over time through instream rehabilitation and riparian thinning projects

**Magnuson-Stevens Fishery Conservation and Management Act of 1996**
The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (hereafter referred to in this section as “the Act”) requires consultation with the National Marine Fisheries Service on activities that may affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH for Pacific salmon includes marine waters, intertidal habitats, and freshwater streams accessible to anadromous fish. Freshwater EFH in Alaska includes all streams, lakes, ponds, wetlands, and other water bodies currently and historically accessible to salmon in the state. Marine EFH for the salmon fisheries in Alaska includes all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. exclusive economic zone. The Act promotes the protection of these habitats through review, assessment, and mitigation of activities that may adversely affect these habitats.

# ENVIRONMENT AND EFFECTS

This section summarizes the physical, biological, social and economic environments of the project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives.

## Alternative 1: No Action – Current Condition

### Vegetation—Direct and Indirect Effects

Since the early 1950's timber harvest has been the dominant human use affecting the project area. Table 3 shows the oldest young-growth stands of any significant acreage are approximately 50 years old. Most of the stands on the upper slopes, were harvested under an even-aged regeneration system using high-lead cable logging systems.

Early even-aged harvesting was conducted from 1959 to 1961 in the Harris River basin. Harvested areas included steep headwater streams and nearly half of the Riparian Management Areas (RMAs). More recent even-aged harvests have occurred in the Upper Harris River basin in 1995 and 2003 with smaller harvest blocks and less intrusive techniques (Table 3).

Regeneration at time of stand initiation for stands above the RMA, is typically abundant (thousands of stems per acre). At ages 15-25, intermediate treatments on timber emphasis acres have typically been precommercial thinning. Approximately 1,226 acres of thinning has occurred in the Harris River watershed to date.

Timber harvest and road building have been the primary management actions that have altered watershed processes. Timber harvest in almost 23 percent of the basin occurred within a 10 year time frame. Most timber harvest and road building within the watershed occurred prior to implementation of the 1997 Tongass Land Management Plan (TLMP), which set specific guidelines for land management activities. As a result, harvested areas included steep headwater streams and nearly half the Riparian Management Areas (RMA). The Lower Harris River sub-basin and Fubar Creek sub-basin RMA's were most heavily harvested followed by harvest in the Upper Harris Watershed.

Early even-aged harvesting methods have caused old growth coniferous stands to be temporarily replaced with mixed deciduous/coniferous stands, particularly in riparian areas. Succession will eventually move these stands toward a conifer dominant stand.

Recent inventories have grouped these stands into commercial, pole and precommercial site types. The existing condition of these stands includes dense canopies and shaded understories. It is anticipated that intermediate treatments on these stands in the near future (5-20 years) would benefit overall forest health by opening the canopy.

Access for these treatments becomes an issue depending on type of stand treatment, equipment needs, resource goals, and existing road conditions. Road decisions will have to take into account stand conditions now and in the near future.

The existing conditions of the stands treated in the RMAs are different due to several factors. The gentler slopes along the streams may have allowed for more ground-based

logging systems to be used. This "heavier handed" approach to logging along with more naturally wide spaced conifers occurring in those zones, has contributed to stands being composed of a more deciduous regeneration component than the upslope stands. A dominant conifer component will be necessary for providing large woody debris for the streams in the future. At this time, trees in harvested riparian areas are too small to provide a long lasting stream component. Maximizing growth on this conifer component has become the emphasis for RMA treatments. Access needs may vary depending on prescription goals and treatment options and would need to be considered for any future treatments in the RMA.

Table 3: Harris River timber harvest history

| Harris River Sub-basin | Year Harvest | Harvest Area, acres | Harvest Sub-basin Total, acres | Total Basin Area, acres | Percent |
|---|---|---|---|---|---|
| Upper Harris River | <1959 | 3 | | | |
| Upper Harris River | 1960 | 166 | | | |
| Upper Harris River | 1961 | 519 | | | |
| Upper Harris River | 1962 | 321 | | | |
| Upper Harris River | 1994 | 17 | | | |
| Upper Harris River | 1995 | 218 | | | |
| Upper Harris River | 2003 | 68 | 1,313 | 8,678 | 15% |
| Fubar Creek | 1960 | 444 | | | |
| Fubar Creek | 1987 | 33 | 477 | 2,982 | 16% |
| Lower Harris River | <1959 | 1,115 | | | |
| Lower Harris River | 1959 | 53 | | | |
| Lower Harris River | 1960 | 609 | | | |
| Lower Harris River | 1962 | 811 | | | |
| Lower Harris River | 1963 | 290 | 2,879 | 7,348 | 39% |
| | | **Totals** | **4,669** | **19,009** | **25%** |

Size classes of the young-growth stands will determine the types and timing of future treatments (Table 4). The following table shows acres of young growth by size class in the Harris River watershed.

## Cumulative Effects of the No Action Alternative on Vegetation

The vigor of some young growth conifers would continue to be suppressed until either, young growth conifers breach the deciduous canopy or the deciduous stands reach the end of their lifespan, and the resulting forest stand approaches climax succession stage.

The lack of mature vegetation and roughness created by floodplain large woody debris within untreated project areas makes them vulnerable to channel avulsions or diversions. Channel avulsion or diversion means that streams abandon their existing channel and pioneer a new channel or divert through an existing smaller side channel. Channel avulsions are natural occurrences. However, when they occur in areas that lack adequate

vegetation or roughness they can cause severe erosion and long-term channel instability. Risk of these accelerated stream processes would remain high until riparian stands approaches climax succession stage.

Table 4 Size class distribution of young growth stands in the Harris River

| Young Growth Size Class | Acres |
|---|---|
| Commercial | 639 |
| Pole | 1,124 |
| Pre-commercial | 1,260 |
| Other | 528 |
| Private | 866 |
| Total | 4,417 |

## Water Quality—Direct and Indirect Effects

Although mass movement is the dominant natural disturbance process in the Harris River watershed, land management operations in the Harris River have influenced both frequency and size of mass movement (Swantson 1991). Studies have shown the occurrence of mass movement processes in harvested areas range from 3 times to 10 times greater than in non-harvested areas. Swanston and Marion, 1991, found a 3.5 fold increase in landslides in harvested areas versus unharvested areas in southeast Alaska. They also noted that landslides in harvested areas tend to be smaller than landslides in unharvested areas. Bishop and Stevens (1962) found a 4 fold increase in landslide rates in harvested areas versus unharvested areas in the Maybeso Experimental Forest. Landwehr (1998) found a 10 fold increase in the numbers of landslides in harvested areas (over a 20 year time period) but noted that slides in harvested areas were typically much smaller than slides in unharvested areas. In another inventory Landwehr (1994) found a three to five fold increase in landslides in harvested areas versus unharvested areas (depending on methods). Vegetation in previously harvested areas would continue to grow and add root mass and stability to the soil, thus landslide frequency would likely decline over time in the harvested areas (Landwehr 1994). Landslides resulting from harvest activities have accelerated sediment delivery to the footslope and associated stream channels causing bank instability, channel widening and/or diversion potential in tributary and mainstem channels. Turbidity and other water quality components would continue to function at existing rates and levels. These background levels would continue to fluctuate with rainfall, rainfall intensity, and residual at new disturbances.

Natural disturbances such as landslides when coupled with human induced stressors may have a greater impact on watershed processes. Landslides are a natural process on the steep slopes of the Harris River Watershed. Two heavy rainfall events in 1961 and 1993 (7.0 year and 4.2 year recurrence interval respectively) initiated widespread landslides

across the entire Harris River and surrounding environment (Gomi, 2004). Site factors usually determine where a landslide will occur but precipitation determines when a landslide will occur (Patric and Swanston, 1969). The 1993 storm event caused at least ten landslides in the Fubar Creek sub basin. Since 1991, eleven landslides led to the aggradation of Fubar Creek alone. Eight out of the 11 landslides originated in harvest units or along the backline of harvest units, where initiation is very common due to windthrow disturbance and the dynamic force that these exposed trees put on the unstable soils at the clearcut edge (Mayn, 2003). These landslides resulted in significant downstream impacts to instream habitat as fluvial processes adjust in response to the massive influx of sediment. Four of these eleven landslides reached Fubar Creek and emptied debris containing high volumes of gravel and sediment directly into or across the stream (Mayn, 2003). Aggradation alters stream processes and hence, stream characteristics such as slope, width, depth, pool frequency, and sinuosity. Downstream impacts resulting from these adjustments include bank failure and channel diversion, altered floodplain connectivity, and ultimately decreased fish habitat.

Roads in the Harris River basin represent a valuable asset for local economic potential, enhanced subsistence opportunity, and other recreational activities. Roads in the Harris River basin, including the Klawock-Hollis Highway (924), total 44 miles. Without proper maintenance, these roads pose a threat not only to current and future usage, but also to hillslope and aquatic resources due to landslides, altered hydrologic connectivity, and stream sedimentation. Culverts are the most common structures used to pass surface water downslope and are often the point of failure through plugging or structural collapse by rusting through as they reach their designed lifespan. Roads may be sources of chronic and catastrophic sediment through fill failures and landslides. Fill saturation caused by unmaintained ditch lines on unstable slopes may result in mass wasting of the road prism and slope below.

### Cumulative Effects of the No Action Alternative on Water Quality

The processes associated with sedimentation would continue as sediment supply out competes the streams ability to transport it. Bank erosion and stream diversions would continue to develop in response to increasing width to depth ratios and lack of deeply rooted riparian and bank vegetation. Risk of mass movement caused by road fill failure would increase through time as unmaintained roads and drainage structures age and fail. To preserve rehabilitated areas and maintain water quality, new road construction would require reconnaissance and design to ensure that slope instability and the road drainage are properly addressed.

Identified stream channels lacking a large wood component would not develop needed complex habitat, would not provide the conditions necessary to maintain sediment transport, and would be more susceptible to bank failure.

## Fish and Aquatic Habitat—Direct and Indirect Effects

River riparian ecosystems are critical components of aquatic habitat health.. The greatest economic benefits attributable to these riparian areas, however, are from the aquatic species including Pacific salmon that are highly dependent on healthy riparian

ecosystems. The Tongass National Forest provides over 80 percent of the freshwater habitat that sustains commercial, recreational, and subsistence fisheries in southeast Alaska. Southeast Alaska has by far the largest number of healthy wild salmon stocks on the Pacific Coast (Casipit et al., 2000). These fisheries conservatively contribute over $250,000,000 annually to the southeast Alaska economy and average $4,300,000 to the Prince of Wales outer island area (Division of Community Advocacy, Southeast Regional Office: http://www.dced.state.ak.us/dca/).

A Forest Service interdisciplinary team conducted stream habitat assessment work during the 2002 and 2003 field seasons in the Harris Watershed. Results indicated that the lower segment of the Harris River was functioning at risk with an upward trend; Fubar Creek was found to be functioning at risk with a downward trend; and Upper Harris was found to be functioning at risk with an upward trend. Non-functioning reaches exist in the more heavily managed areas of the Upper Harris and are interspersed throughout the entire watershed. Non-functioning stream reaches are those that have been found to display instream processes that are uncharacteristic compared to similar undisturbed channel types. These processes are often in response to upstream disturbances. Several factors were identified as limiting watershed function, including lack of large woody debris, inadequate riparian vegetation (structure and composition), and excessive channel erosion and aggradations.

With 47 percent of the RMA harvested, there has been a reduction in bank stability due to the loss of root strength of large conifers and a reduction in floodplain roughness resulting in an increase in the frequency of bank failure and stream diversion. Riparian harvest also resulted in conversion from conifer to alder dominated canopy. Alder dominated canopy is shading and suppressing conifer recovery in riparian areas. Large mature conifers provide critical instream structure, fish habitat, and floodplain protection.

## Cumulative Effects of the No Action Alternative on Fish and Aquatic Habitat

Current water temperature, sediment inputs, woody debris and hydrologic processes would continue to function at existing rates and levels. Fish species and populations would remain relatively unchanged from current negative trends. Under the No Action Alternative, unstable stream bank conditions will continue to be indirectly affected by degraded riparian conditions and low levels of large woody debris.

Off-channel habitat conditions would continue to be negatively affected by degraded riparian and floodplain large woody debris levels. The lack of mature vegetation and roughness created by large woody debris on the floodplains within the project area makes them vulnerable to channel avulsions.

Channel width to depth ratio may continue to increase from the lack of stable large riparian vegetation (conifers) and further exacerbate problems in the existing wide, shallow, homogeneous stream reaches. Lacking cover and cold water refuge, resident and anadromous fish become susceptible to predation, algal blooms, decreased oxygen levels, limited drift feeding locations, and sustained elevated water temperature and therefore does not meet the Purpose and Needs.

The decline of instream habitat quality would result from continued sedimentation from historic and future landslides stalling in the system instead of being transported through, road failures, disrupted hydrologic connectivity, and stunted recovery of riparian and floodplain environments. Sustained sedimentation would continue to widen and shallow the Harris River mainstem causing additional bank failure and channel diversions that further aggravate sedimentation. A further decline in instream habitat would stress sensitive salmonid populations important to the economy of Prince of Wales Island communities. Natural recovery would be susceptible to new natural and management related impacts due to uncoordinated activities, inability to take advantage of funding opportunities, and lack of consideration for cumulative affects.

The inland aquatic habitat is a critical component to the salmon life cycle. Aquatic impacts from past management activities would continue to stress some salmon species and ultimately affect local fisheries and the associated economy.

## Wildlife—Direct and Indirect Effects

The base information for most of this analysis comes from the Geographical Informational System (GIS). GIS data provides the best information currently available to describe habitats in this area. The Harris River Watershed Rehabilitation Project Area encompasses one Value Comparison Unit (VCU) 6220, as identified by the Forest Plan (USDA 1997) and three Wildlife Analysis Areas (WAAs) 1317, 1318, and 1332, as defined by the Alaska Department of Fish and Game (ADF&G). A WAA is a geographical area used by ADF&G to manage game populations.

The Project Area includes a high number of managed timber stands which are currently approaching understory exclusion, which has significant implications for wildlife species that depend on understory plants for forage. Sitka black-tailed deer rely on high-volume, mature forest at lower elevations for winter habitat (Hanley and Rose 1987); (Yeo and Peek 1992). These mature old-growth stands intercept snowfall, provide thermal cover, and provide a largest biomass of shrub and herb forage for deer (Alaback 1982). The young generation stands in the Project Area may have provided forage during past snow-free months, but offer little in the way of available forage during heavy snowfall years or after they reach understory exclusion stage. Deep snow winters and limited suitable habitat can combine to impact deer populations. Predation interacts strongly with winter severity in impacting deer populations. Fragmented winter habitat and high road densities also make deer populations more vulnerable to wolf predation and human harvest.

An interagency model (Suring 1992) based on WAAs has been developed to evaluate potential winter habitat capability for deer. WAAs 1317, 1318, and 1332 are included in the Harris River Watershed Rehabilitation Project Area. The model is a tool used to assess the effects of timber harvest activities on the habitat suitability and capability of an area. The model calculates habitat suitability indices (HSIs) base on timber volume strata, aspect, elevation, and typical snowfall. Habitat suitability indices values are used to calculate and compare habitat capability and to estimate changes in habitat capability. Habitat capability is the theoretical number of deer that particular habitat types can be expected to support. Although it does not reflect the actual number of deer in an area, the

model can be used to estimate the percentage of habitat capability remaining after harvest. The average habitat capability of the three WAAs in the Project Area is 83 percent (USDA 1997).

A major reduction in the amount of high-value deer winter range has occurred in the Project Area. Past timber harvests in this area concentrated on the large tracts of historic high-value deer winter range. Harvested stands are currently even-aged homogenous stands that provide little deer winter range value. The typical development of an even-aged stand without intermediate thinning treatment includes a seedling stage (1-25 years following harvest), a stem exclusion stage (26-150 years), and an understory re-initiation stage (150-250 years) (Alaback 1984). A large portion of the young growth is in the stem exclusion stage and is considered poor wildlife habitat.

## Cumulative Effects of the No Action Alternative on Wildlife

Quality of wildlife or riparian habitat would continue to function at existing rates and levels. No additional thinning projects would be implemented to improve habitat for wildlife species. Forbes and shrubs that support wildlife would continue to be shaded from dense overstory vegetation in stem exclusion serial stage and even-aged homogenous stands would continue to provide poor deer winter range.

## Subsistence—Direct and Indirect Effects

The Alaska National Interest Lands Conservation Act (ANILCA) Section 810 requires the Forest Service to analyze the potential effects of proposed rehabilitation activities on subsistence uses and needs. Criteria used to assess the effects of the No-Action and Proposed Action alternatives include whether subsistence uses within the Project Area may be significantly restricted by any of the alternatives. Only rural residents qualify as Federal subsistence users (ANILCA, Title VIII).

Subsistence use in the Harris River is high due to ease of access from the Hollis-Klawock Highway, relative distance from island communities and the Hollis Ferry Terminal, and access points to river and upland habitats. Subsistence opportunities are very important to both Native and non-Native people on POW. Subsistence hunting, fishing, trapping, and gathering activities occur within the proposed action area. Effects on subsistence resources and uses important to rural communities are discussed in three categories: abundance and distribution, access, and competition.

**Abundance and Distribution**

The Harris River Restoration Plan encompasses a geographical area that includes diverse subsistence resources such as deer, black bear, furbearers, small game, waterfowl, salmon, plants, and firewood throughout the proposed Project Area.

The No Action alternative may affect subsistence use. Reductions in both fish and wildlife habitat capability would likely become less complex as forests move into stem exclusion stage.

Community use of deer for subsistence purposes is well documented and studied for the rural communities of SE Alaska. Community use of specific geographic areas for obtaining deer is estimated by the WAAs used by the State of Alaska. The WAAs

included in this Project Area have the following average deer harvest numbers: WAA 1317 (76 deer), WAA 1318 (328 deer) and WAA 1332 (67 deer).

With application of the riparian standards and guidelines on the Forest Plan, no significant adverse effects on salmon or trout species are anticipated. No significant adverse effects are anticipated for wildlife species, including deer.

**Access**

The road network on POW provides access to many areas that were previously unconnected and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the potential for increased competition. While road systems tend to bring more people into an area, roads also provide subsistence hunters access to previously remote regions and provide a greater opportunity for subsistence harvest. Long-term access into the area may be compromised as old road vegetate over.

**Competition**

Subsistence resources are distributed across POW. The extensive road system on POW tends to disperse competition for available resources. No reduction in wildlife populations is expected due to this project or overall subsistence harvest of deer, bear, or wolves due to changes in competition. Overall long-term access into the area should be improved, due to road improvements which distributes subsistence users and decreases competition. There would be no significant possibility of a significant restriction on subsistence use of deer, black bear, marten, wolf, otter or other wild foods as a result of the proposed action. Reductions in fish and wildlife habitat capability may result in less fish and wildlife resources within the watershed

## Cumulative Effects of the No Action Alternative on Subsistence

Subsistence users would continue to be limited to existing access and the deteriorating condition of the existing roads and trails. Access trails and roads would not be improved. Changes in subsistence use would not be expected to occur in the short-term. Roads and trails that do not receive maintenance may vegetatively close in, eventually limiting access. Road surface erosion may also continue to deteriorate to the point of limiting access or increase public safety risk. Reductions in wildlife habitat capability would occur as existing young growth reaches stem exclusion stage. Fisheries resources may be reduced due to reduced habitat capability. As instream wood breaks down, the channel becomes less complex.

## Recreation—Direct and Indirect Effects

Two of the three established trails in the Harris River basin, Twentymile Trail and Harris River Trail, have been converted from old haul road routes. These trails provide access to the headwaters of the Harris River mainstem and the lower Harris River mainstem. Both trails have moderate (seasonally high) public use. Annual trail maintenance occurs on these trails to remove vegetation and improve the tread, but major reconstruction may be needed in some sections. These old road beds are impeding the natural flow of water

from upslope streams. Small dilapidated low elevation foot crossing structures have been placed across some small stream crossings where waterbars were constructed. Other stream crossings were left for hikers to ford. The foot crossing structures are collapsing into the stream crossings and posing risk to hikers falling through or having the structure collapse from failing fasteners or rotting timbers. Forded stream crossings suffer from bank trampling.

## Cumulative Effects of the No Action Alternative on Recreation

Visitors to Prince of Wales Island would continue to find trail systems and access roads affected from stream capture, erosion, and inadequate drainage. Hikers would continue to ford streams, washed-out sections of trail, and cross deteriorating stream crossing structures.

As road and trail infrastructure deteriorate due to lack of maintenance and improvement recreation use would decrease. Some trails and roads would eventually become unsafe to the point of administrative closure to the public. Use of the roads and trails would be expected to increase regardless of condition or closure as public awareness of and access to Prince of Wales Island improves. Although annual maintenance keeps the trails open and free of vegetation, stream crossing structures and portions of trails are derelict and somewhat unsafe. Some trail and road recreational users would be dissuaded from using some areas while others who venture on would be at greater risk of injury.

One Duck Trail is an established trail that begins in the headwaters of Fubar Creek which accesses alpine areas along the Fubar Creek - Indian Creek ridgeline. The One Duck Trail does not have immediate environmental resource concerns and will not be further considered for watershed rehabilitation treatments; however, design work is being completed and major reconstruction is scheduled for 2008-2009.

The Harris River Trail (2024050-North) would continue to be eroded away by the adjacent stream. In more than one location the trail has captured the stream leaving the lower portion of trail in an obliterated state with debris and cobbles to be traversed. The Harris River side channel crossing would continue to be a forded crossing causing bank erosion and potential damage to active spawning beds at crossing. Bank failure along the "island" would continue to erode and undermine the trail and potentially divert across the trail blocking access.

The Fubar Creek Road/Trail (2024050-South) would not be reopened as part of the Fubar Creek Rehabilitation Phase II project and would remain an unimproved dispersed recreation site.

The Twentymile Road (2025000) leading to the trailhead would not be improved and continue to provide an unnecessarily rough ride on a road designated for passenger cars and increase public safety risk.

The Twentymile Trail beyond the trailhead would not be improved. Stream crossing structures will continue to deteriorate and increase public safety risks. Stream crossings currently causing flooding or diverting down the trail would not be corrected, forcing visitors to either abandon their hike or ford less safe portions of the trail.

## Heritage—Direct and Indirect Effects

The cultural history of Prince of Wales Island, as archaeologists currently understand it, begins at the end of the Holocene era after retreat of the Wisconsin ice sheets. With the melting of the continental glacier at the end of the Ice Age (17,000 to 11,000 years ago), sea levels, once depressed by as much as 380 feet in the vicinity of Prince of Wales Island, began to rise. A complex interaction of rising sea level, isostatic rebound with removal of the weight of ice, and deformation of the earth's crust result in changing locations of the island shorelines. This change in relative sea level was accompanied by changes in the vegetation and wildlife components of the environment. The arctic conditions of 17,000 years ago gave way to tundra-like conditions by 13,000 years ago and a forest composed of the same species represented today by approximately 11,000 years ago (Ager 2002).

Prince of Wales Island was formerly divided among several subgroups of Tlingit. The Stikine (Shax'heen) kwaan included the northeast coast of Prince of Wales Island in their territory. The Heenya kwaan inhabited the northern half of the western part of the island. The Klawock (Lawaak) kwaan, who may have also been part of the Heenya kwaan, resided along the west-central coast of Prince of Wales. Finally, the Tongass (Taant'akwaan) kwaan held the southern third of the island before the Kaigani Haida displaced them in the early 18th century (Ardnt et al. 1987:85-95). The Haida village of Kasaan is located in Kasaan Bay, east of the current project area.

Kasaan was a substantial community in the 1800s. The current project area falls firmly in the heartland of the Kaigani Haida people of Kasaan.

The historic period on Prince of Wales Island encompasses the major themes seen throughout Southeast Alaska. These are described in detail by Ardnt et al. (1987). The periods represented include Exploration and the Maritime Fur Trade (1741-1799), American Military Rule (1867-1884), Salteries and Canneries (Commercial Fishery 1867 – present), Mining (1900 – 1942), and Timber Industry and forest management (1902 – present).

The material remains of the hard rock mining era in and around Hollis is a significant cultural resource and holds significant potential for study and interpretation. The cultural landscape of the project area reflects the most recent economic use of the area. Designated as an Experimental Forest, the Maybeso Valley became a field laboratory for forestry practices. Large scale experimental clear cutting began near Hollis with the establishment of the Ketchikan Pulp Company camp in 1955. With movement of the Hollis camp north to Thorne Bay in 1961 the intensity of activity in the Hollis area diminished.

## Cumulative Effect of No Action on Heritage

Alternative 1 (No Action) results in no change in the existing condition. Selection of Alternative 1 would result in no direct or indirect effects on heritage resources. Cumulative effects would derive entirely from past activities in the watershed.

### Scenery—Direct and Indirect Effects

The project area is primarily seen by forest visitors when traveling between Hollis, Klawock and Hydaburg. Views are generally within foreground and middle ground distance zones.

Extensive timber harvest occurred in the Harris River watershed during the 1960's. As a result of past harvest abundant second-growth regeneration blankets most of the seen landscape. Little if any variation in form, line, color and texture is visibly evident. This continuous vegetative cover with little or no pattern results in a landscape with minimal visual features.

Due to the continuous vegetative blanket of second young in the project area, changes to the visual appearance of the landscape are easily noticed and perceived as disturbances. Disturbances that exist in the project area are generally not of size or shape to completely dominate the viewshed. In some cases changes are noticeable but resemble natural patterns as a result of aging second growth. As a result of past harvest within the project area the Existing Visual Condition (EVC) is a Type IV.

### Cumulative Effects of the No Action Alternative on Scenery

Cumulatively the disturbances caused by past management activities are well within the percent allowable disturbance thresholds for change in each LUD designation.

## Alternative 2: Proposed Action

The preferred action alternative would have a long-term benefit to channel function, aquatic and riparian habitat, and reductions in turbidity and channel diversions. This alternative would store or decommission approximately 9 miles of road, improve 3.5 miles of road, improve 4 miles of trail, complete 5 miles of instream rehabilitation, and improve about 100 acres of riparian and floodplain.

### Vegetation—Direct and Indirect Effects

The goal of riparian thinning within priority treatment areas is to accelerate the growth and development (successional pathways) of young-growth riparian areas toward their climax successional stage. These characteristics typically include large and widely spaced trees having a diverse understory of shrubs. There are 439 acres of thinned riparian area in the Harris River Watershed.

Preliminary monitoring results from early thinning treatments and stand modeling elsewhere on the Tongass indicate that the direct effects of thinning can reduce the time it takes to attain desired future riparian stand conditions by as much as 50 percent (Twelvemile Arm Landscape Assessment, 2006).

Several management objectives have been identified to address thinning treatments in riparian areas. Since the riparian area is an important ecological corridor for a number of ecosystem functions, we have broken the objectives into three broad groups of indirect effects: Stream morphology/fish habitat; nutrient cycling/energy regimes; and wildlife

habitat. Treatment prescriptions are tailored to each objective and site condition. However, loss of individual trees to windthrow in some areas may negate growth gained. Prescriptions will have to carefully consider windthrow potential.

- Stream morphology/fish habitat: Provide for pool development and bank and channel stability by encouraging the development of short and long-term vegetative cover along stream corridor, including incorporation of large, wood (boles, tree roots, branches) within the stream channel.
- Nutrient cycling/energy regimes: Provide for short and long-term vegetation characteristics that promote shading and litter fall from streamside vegetation (Gregory et al. 1991, Koning 1999).
- Wildlife habitat: Provide for the development of large and small trees and snags that provide perching sites, cavities, and retain travel routes.

Raw material needed for instream large woody structures would be gathered from the Harris River, Maybeso Creek, and Indian Creek drainages. A portion of the standing trees would either be cut or pushed over to retain the stabilizing root mass. Approximately 1,500 logs and an adequate number of rootwads would need to be collected to complete all proposed instream wood projects. Selection of trees would be dispersed and limited to existing road systems to minimize the impacts of harvest and commercial equipment. Log selection would first target down or standing dead trees, old decked logs, and non-merchantable young growth and old growth trees suitable for instream rehabilitation needs and project budget requirements. When all other selection options have been exhausted, old growth non-merchantable and commercial grade trees would then be selected.

Individual tree selections would be made by an interdiciplinary team to assure feasiblity, BMP's are followed, and impacts are minimized. Coniferous hemlock is the primary target species, but spruce and cedar may also selected. The target size are trees 14 inch to 24 inch diameter second growth trees and up to 36 inch old growth. The target resulting log length desired would be 40 to 60 feet. Additional ground disturbance is expected when trees are pushed over. This additional impact is not expected to be significant for the reason that the percentage of trees where this technique would be achievable will be small. Mulching and possible seeding and planting of disturbed ground in these areas would minimize soil mobilization. Logs may be collected from the following road systems: 2025000, 2026000, 2026200, 2024200, 2024300, and 2016000. Logs would be collected within 100 feet of the road using shovel heavy equipment and choker. Road and ground disturbance associated with heavy equipment and log extraction is expected to be dispersed and short-term. Mitigation measures may include mulching, seeding, road surface reconditioning, and inboard ditch clearing.

As available, additional logs will be collected from adjacent instream project areas that meet riparian and wildlife thinning goals.

## Cumulative Effects of the Proposed Action on Vegetation

Aproximately 20 acres of riparian thinning would occur to treat stands not yet treated or needing additional thinning treatment. These treatments would accelerate rate of stand

succession to the desired old growth condition. As the young growth stands mature and trees begin to fall through natural processes, indirect effects to the floodplain and instream habitats would occur.

Rehabilitation activities would work to restore the watershed to an ecologically functioning condition. As part of this rehabilitation, selected locations would be altered by management activities either to restore degraded riparian and instream conditions or to provide benefits to wildlife. The proposed action would restore riparian habitat along Harris River and its tributaries to pre-timber harvest conditions and enhance fish and riparian wildlife habitat. Up to 1,500 trees collected from the watershed or from other adjacent watersheds, with or without rootwads would have the immediate effect of changing the appearance of the area in and around stream segments selected for instream rehabilitation and the areas from which the trees would be collected. There would be changes in the general appearance of the project locations until the vegetation grows back in areas of intense activity. The trees would provide the materials necessary for project activities. Temporary access points to instream worksites would remove trees and understory vegetation from the project area. Trees removed in access construction can be used for project materials in stream restoration. Effects of access point construction on vegetation would be low. In summary, the project would have the net effect of improving riparian conditions by thinning young growth trees and improving streambank conditions. Instream project access construction would temporarily displace vegetation until native vegetation grows back.

Forest management treatment access is not expected to be significantly impacted by road storage and decommission treatments. Roads proposed for storage and decommission are either already partially stored, vegetatively closed, or are physically cut off from drivable road systems. These roads may be failing to the point of requiring major rebuild and pose risk of fill or stream crossing failure. These roads may also exhibit potential for slope soil loss and/or stream sedimentation through mass movement initiation. Roads that access stands available for commercial thinning treatment under 5 years, depending on site conditions, would be defered from storage or decommission treatments until forest stand treatments are completed. Road storage treatments intend to preserve and protect road reaches from fill failure, fluvial erosion, and damaging vegetation. Road reaches that are failing or that have a high risk of failure would be stabilized by removing unstable road fill and require future entry efforts to rebuild removed sections of road. These roads are in compliance with the current Craig and Thorne Bay Ranger District Access Travel Management (ATM) plan.

## Water Quality—Direct and Indirect Effects

Increased turbidity is a direct effect of instream restoration. Heavy equipment, mobilization of large wood or rock have the ability to affect the levels of instream turbidity. A monitoring effort following restoration of Fubar Creek showed increased levels of turbidity for a short duration (Prussian 2007). The increased levels of turbidity were a function of instream activity and coincided with rainfall events. Fubar Creek Restoration included heavy equipment instream and the input and mobilization of large wood and rock, and stream gravels. Turbidity levels during this work exceeded 250

NTU's for a short duration of time. The initial flush of turbidity occurred following the diversion of water back into the lower channel following three weeks of instream work. This increase in turbidity exceeded 250 NTU's; however, the turbidity decreased by 87 percent in three hours and 96 percent in 15 hours. The time needed to attain background condition was not available from the Fubar Creek Restoration monitoring project.

State Water Quality Standards and Forest Service BMP's suggest attaining levels of turbidity within 5 NTU's above background condition within 48 hours of instream work. The potential for attaining this standard is largely dependent upon the flushing of the turbidity and the mobilization of the streambed and the type of instream work prescribed. If a large rainfall event occurs, water levels will rise, streambed materials may become mobilized, and turbidity will flush out of the system in a short period of time. However, if the water levels remain low, turbidity may occur in small levels over a longer period of time. In all cases, sediment fences, silt fencing, and careful attention to details of work will reduce the impacts of turbidity and improve the condition of surface waters for fish and other aquatic animals.

## Cumulative Effects of the Proposed Action on Water Quality

Adverse effects to water quality would be primarily short-term and would occur during construction.

Road decommissioning and stormproofing treatments would significantly reduce the potential for catastrophic fill and stream crossing failure on non-maintained roads in the Harris River. Sediment otherwise at high risk of mobilization to streams systems in the basin would be safely stockpiled and contoured with the landscape. Road drainage improvement would correct fish/road passage issues and restore hydrologic connectivity such that streams would flow freely without diversion across roads and storm flow timing and duration may reflect conditions that are more natural.

Sediment supply would be expected to continue to fluctuate in response to residual and new bank and hillslope disturbances. Rehabilitation efforts would attempt to stabilize stream channels by introducing stable instream structures that redirect water energy to produce work (expend energy) that will scour, store sediment or move them through the system, and provide for stream bank protection. In response to natural processes and rehabilitation efforts, sediment transport capabilities would increase and sediment supply would decrease.

Large wood structures and increased bank stability would provide a more defined stream channel with greater lateral migration resistance, which directly decrease width-to-depth ratios in the short term. Analysis of previous restoration efforts suggests that width-to-depth ratios may be reduced by one-third or more in the year following structure installation (USDA Forest Service 1997). This immediate enhancement of channel morphology would foster recovery of riparian vegetation and improvement of stable riffle and pool development.

There would be no measurable long-term effects to water quality or water quantity as a result of the proposed action. Water quality and quantity would improve as erosion controls, road drainage improvements and storm proofing, and road cut and fillslope stabilization projects are completed throughout the watershed.

## Fish and Aquatic Habitat—Direct and Indirect Effects

The increase in primary pools from instream rehabilitation activities would directly and indirectly benefit all species and life stages of fish by providing low water velocity resting habitat, bubble curtains, and depth that provide hiding cover from predators. In addition, the increase in pool habitat would indirectly increase foraging efficiency for juvenile and resident life stages of fish.

Instream and riparian rehabilitation directly affects the floodplain and wetted stream channel. Instream and riparian rehabilitation may include the use of heavy equipment and power tools to manipulate large wood, rock, and gravel in order to move or harvest raw materials, build or rebuild existing access routes, and construct instream habitat features.

One of the objectives of this project is to increase floodplain stability and increase large woody debris levels within side channels and on floodplains that would reduce the risk of adverse affects of channel avulsions and would indirectly accelerate the recovery of riparian vegetation in the long term.

Large wood structures and increased bank stability would provide a more defined stream channel with greater lateral migration resistance, which would indirectly decrease width-to-depth ratios in the short term. Analysis of previous restoration efforts suggests that width-to-depth ratios may be reduced by one-third or more in the year following structure installation (USDA Forest Service 1997). This immediate enhancement of channel morphology would foster recovery of riparian vegetation and improvement of stable riffle and pool development. Reduction of width-to-depth ratio and increased stream shade in the long term could also locally decrease water temperature and therefore provide additional cold water refuge in otherwise shallow homogeneous reaches.

The addition of large woody debris would dramatically increase channel complexity, protect riparian conifers, increase pool quality and retain nutrients. Benefits to adult and juvenile salmonids from the addition of large woody debris include the addition of cover, increased pool depths and retention of carcasses and other organics. Salmon carcasses may contribute anywhere between 20-30 percent of the nitrogen and phosphorus into a particular system (Bilby, 1993). The marine-derived nutrients associated with salmon carcass decomposition are now known to play a major role in the productivity of aquatic and riparian systems associated with anadromous fish watersheds in the Pacific Northwest (Cedarholm, 2000). The addition of large woody debris and the increased retention of these nutrients would indirectly affect all ecosystem aspects, ranging from stream microorganisms and benthic macro invertebrates, to top-level predators such as eagles and bear.

Implementation of this alternative would indirectly benefit both juvenile and adult salmonids by creating large lateral pools for rearing and resting during migrations and over-wintering.

Heavy equipment can disturb soil and potentially destabilize stream banks that can lead to surface erosion and bank failure. Heavy equipment also poses a risk of hazardous material exposure to the affected areas. Additionally, in order to access the floodplain

and channel, old roadbeds would be re-opened and new temporary surfaces created. Through project planning, protection of surfaces, reconditioning of banks, hazardous spill prevention and contingency planning, and other mitigating measures, physical and water quality impacts (see Water Quality section) would not be significant. Best Management Practices would be applied to protect resources.

**Essential Fish Habitat**

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (hereafter referred to in this section as "the Act") require consultation with the National Marine Fisheries Service on activities that may affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH for Pacific salmon includes marine waters, intertidal habitats, and freshwater streams accessible to anadromous fish. Marine EFH for the salmon fisheries in Alaska includes all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influence of tidewater and tidally submerged habitats to the limits of the U.S. exclusive economic zone. The Act promotes the protection of these habitats through review, assessment, and mitigation of activities that may adversely affect these habitats.

The EFH assessment follows the agreement dated August 25, 2000 between the National Marine Fisheries Service and the USDA Forest Service and includes: 1) a description of the Proposed Action; 2) an analysis of individual and cumulative effects of the action on Essential Fish Habitat (EFH), the managed species, and associated species such as major prey species, including affected life histories; 3) the USDA Forest Service's views regarding effects on EFH; and 4) a discussion of proposed mitigation, if applicable.

The Proposed Action and alternatives to the Proposed Action are described on pages 15-25. This report contains specific discussions of watershed restoration projects by alternative and its effects on the aquatic environment. This analysis assumes fish habitat would benefit by; riparian projects improving floodplain function, removing crossing structures, decommissioning roads, and placing LWD within the stream on Class I and II streams. The more crossings removed from these stream classes along with placement of LWD, the greater the long-term benefit. Short-term sediment inputs would be expected during structure removal or placement of LWD.

EFH in this analysis includes all stream segments and lakes where commercially fished salmon species occur during any period of the year. In essence, this includes all Class I stream and lake habitat on the Craig Ranger District. Anadromous species in the project area include coho, pink, and chum salmon, steelhead, cutthroat, and Dolly Varden char. These species spawn, incubate, and rear primarily in the lower stream reaches. The juvenile coho, steelhead, cutthroat, and Dolly Varden char feed predominantly on aquatic and terrestrial insects in freshwater. Juvenile chum and pink salmon feed in estuary and near shore habitats.

Potential effects of roads on EFH would be degraded water quality and altered physical stream habitats. Storing roads and removing culverts may cause small, localized reductions in water quality during implementation, but improve water quality thereafter. Degraded water quality results from increased water temperature or suspended sediment. Potential changes in physical habitat include filling pools with sediment and changing

substrate composition. Pools are important for rearing and over-wintering of juvenile coho and other fish. Higher sediment (fines) levels in the substrate can reduce survival of fish eggs and change the assemblages of aquatic insects used by fish for food.

The action alternative would not cause detectable effects (negative) on the managed fish species because Forest Plan direction and applicable Best Management Practices (BMPs) and Project Design Criteria (PDCs) would be applied during implementation of road closures, decommissioning, and maintenance activities and the scale of the project area is small compared to EFH as a whole. Forest Plan direction and BMPs were developed through interagency negotiation and provide state-of-the-art protection of fish habitat.

Occasionally, Forest Plan direction, PDCs, and BMPs are not fully implemented or are not fully effective. Thus, there is always some risk to EFH when management actions are taken. The risk of this restoration project is minimal. Stream crossing structures would be removed on stored or decommissioned roads, which would reduce their potential for failure during storms. This action would also remove structures that interfere with natural fish movement patterns. On non-decommissioned roads, efforts to restore fish passage through improperly installed stream culverts would continue. Thus, the action alternative would benefit salmon streams by storing or decommissioning roads, removing stream crossing structures, and placing LWD in streams.

Essential Fish Habitat (EFH) is designated by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 as habitat that is currently or was historically available to pink salmon (*Oncorhynchus gorbuscha*), chum (*O. keta*), coho (*O. kisutch)*, sockeye (*O.nerka*) and chinook (*O. tshawytscha*) salmon (Federal Register 2006 Vol. 71, No. 232). All projects would occur within or adjacent to EFH.

## Cumulative Effects of the Proposed Action on Fish and Aquatic Habitat

The rate of instream habitat recovery from historical impacts would increase as long-term floodplain and riparian area treatments increase floodplain roughness, stabilize banks, and ultimately provide a source of instream large woody debris. Instream rehabilitation treatments would provide an immediate source of large woody debris that would increase habitat complexity through pool formation and sediment sorting. These treatments, in conjunction with decreasing sediment supply (barring additional catastrophic road or hillslope failures), would continue to improve fish habitat by decreasing channel width and increasing channel depth.

*Substrate characteristics* – There would be measurable effects to substrate as a result of all projects. Sediment is expected to decrease as riparian projects improve floodplain function. Upland and road projects would disconnect or remove sediment sources to fish-bearing streams, and instream projects would create roughness and allow substrate sorting.

*Large woody debris (LWD) within the channel and LWD source areas* – There would be a measurable effect to large woody debris or large woody debris source areas due to the proposed action. Following Aquatic Habitat Management Handbook (FSH 2090.21) guidelines, LWD would be installed in various stream reaches throughout the watershed

currently lacking LWD.

*Channel geometry* – There would be no measurable impact to fisheries or aquatic organisms from peak flows capable of altering the channel geometry due to wildlife improvement projects. Channel geometry would be altered and improved during instream projects and as chronic sediments sources are disconnected over time by storing or decommissioning roads and removing corresponding cross drains.

*Fish passage* – There would be an effect to fish passage. As recommended in this document, up to 6 culverts on fish bearing streams would be restructured to allow fish species in all life stages access to historical habitat (Map 2, Table 2).

*Forage species (aquatic and terrestrial invertebrates)* – Forage for pink, chum, coho, sockeye, and chinook salmon would increase as habitat improvement projects create more complex habitat. Riparian vegetation would continue to provide sources of terrestrial invertebrates. Aquatic invertebrate populations would increase since there is a positive measurable effect to water quality or substrate.

*Federal agency conclusions regarding the effects of the action on EFH:*
The proposed action "*Will Not Adversely Effect"* (WNAE) EFH for pink, chum, coho, sockeye, or chinook salmon in Harris River or its tributaries.

*Proposed mitigation (if applicable):*
Without any mechanisms for an adverse affect on EFH, there are no mitigation measures proposed.

## Wildlife—Direct and Indirect Effects

It is anticipated road storage/decommission, wildlife emphasis thinning, and riparian habitat improvements in the proposed action will improve habitat for a wide variety of native and desired non-native wildlife species and subspecies that are associated with old-growth forests within the Harris River watershed.

**1. ESA Species**
No direct, indirect, or cumulative impacts are expected to occur to any threatened, endangered, or proposed species from activities related to the Harris River Restoration Plan in the foreseeable future. No marine environment habitats are included in this project which has the potential to provide nesting, roosting, foraging, cover or dispersal habitat to the U.S. Fish and Wildlife Service (FWS) listed species: Stellars eider (*Polysticta stelleri*), spectacled eider (*Somateria fischeri*), Eskimo curlew (*Numenius borealis*), short-tailed albatross (*Phoebastria albatrus*) or northern sea otter (*Enhydra lutris kenyoni*).

ESA species managed by the National Marine Fisheries Service (NMFS) that may occur in Alaska or on the Tongass NF include the Blue whale (*Balaenoptera musculus*), North Pacific right whale (*Eubalaena japonica*), Fin whale (*Balaenoptera phyalus*), Sei whale (*Balaenaoptra borealis*), Sperm whale (*Physeter macrocephalus*), Bowhead whale

(*Balaena mysticetus*), Humpback whale (*Megaptera novaeangliae*), Steller sea lion (*Eumetopias jubatus*), snake River Sockeye Salmon (*Onchorhynchus nerka*).

**2. Species of Concern**

The Tongass National Forest cooperates with the FWS and NMRS to maintain a current list of Species of Concern. Species of Concern is an informal term, not defined in the federal Endangered Species Act (ESA). The term commonly refers to species that are declining or appear to be in need of concentrated conservation actions or insufficient information is available to indicate a need to list the species under the ESA.

The Prince of Wales flying squirrel (*Glaucomys sabrinus griseifrons*), spruce grouse (*Falcipennis canadensis*), marbled murrelet (*Brachyamphus marmoratus*), and harlequin duck (*Histrionicus histrionicus*) may potentially be present in the Project Area. However, these habitats are protected by existing Forest Plan Standards and Guidelines for riparian areas, therefore, effects due to habitat removal or modification are not anticipated. Various migratory bird species may also occur within the Project Area seasonally which are identified as Species of Concern in Southeast Alaska. There are no anticipated effects to these species.

Other Species of Concern which may be present on the Tongass NF or Project Area include the blue grouse (*Dendragopus obscurus*), Western screech owl (*Otis kennicottii*), black swift (*Cypseloides niger*), Vaux's swift (*Chaetura vauxi*), rufous hummingbird (*Selasphorus rufus*), red-breasted sapsucker (*Sphyrapicus ruber*), olive-sided flycatcher (*Contopus cooperi*), western wood-peewee (*Contopus sordidulus*), Hammond's flycatcher (*Empidonax hammondii*), Pacific-slope flycatcher (*Empidonax difficilis*), Steller's jay (*Cyanocitta stelleri*), northwestern crow (*corvus caurinus*), chestnut-backed chickadee (*Poecile rufescens*), American dipper (*Cinclus mexicanus*), varied thrush (*Ixoreus naevius*), Townsend's warbler (*Dendroica townsendi*), blackpoll warbler (*Dendroica striata*), MacGillivray's warbler (*Oporornis tolmiei*), golden-crowned sparrow (*Regulus satrapa*), golden-crowned kinglet (*Zonotrichia atricapilla*).

**3. Sensitive Species**

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern on Forest lands. Either a significant current or predicted downward trend in population numbers, density, or habitat capability indicates a viable concern. The Alaska Region Sensitive Species List was last updated in June 2002.

The Queen Charlotte goshawk (*accipiter gentillis laingi*), osprey (*Pandion haliaetus*), Peale's peregrine falcon (*Falco peregrinus anatum*), and trumpeter swan (*Cygnus buccinator*) have potential to be present in the action area. The Forest Plan has specific protective standards and guidelines to address goshawk habitat and support viable populations of goshawks over the long-term. Additional protection of habitat elements important to these species is provided by Marten Habitat standards and guidelines. The project is not anticipated to increase the likelihood of any adverse effects on these species populations, nesting habitat, winter habitat, or result in a loss of species viability.

**4. Management Indicator Species**

Management Indicator Species (MIS) are vertebrate or invertebrate species whose response to land management activities can be used to predict the likely response of other species with similar habitat requirements (USDA Forest Service 1997).

Ten of 13 MIS species identified in the Tongass Forest Plan are known to occur on Prince of Wales Island and may be present within the Project Area. These species include the Alexander Archipelago wolf (*Canis lupus ligoni*), American marten (*Martes americana*), black bear (*Ursus americanus*), river otter (*Lutra canadensis*), Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), bald eagle (*Haliaeetus leucocephalus*), brown creeper (*Certhia americana*), hairy woodpecker (*Picoides villosus*), red-breasted sapsucker (*Sphyrapicus ruber*), and Vancouver Canada goose (*Branta canadensis*). Most of the current MIS represent varying needs related to old-growth associated species.

The proposed projects short-term affects due to road closure, riparian thinning, floodplain roughening, and instream channel restoration are not anticipated to produce habitat reductions for MIS species within the Project Area.

Road storage or decommission in the Project Area will benefit MIS that are vulnerable to road density and habitat fragmentation. For example, scientific information from Southeast Alaska suggests that road densities of greater than 0.7 to 1 mile of open road per square mile can lead to mortality rates that cannot be sustained by wolf populations (Person 2001). Wildlife studies indicate that Sitka black-tailed deer, black bears, wolves, and marten abundance may be inversely correlated with road density.

Riparian thinning is expected to increase critical deer winter habitat within the Project Area. Restoration on winter habitat critical to deer in these forest stands would occur by opening the canopy and allowing sunlight to the forest floor, increasing understory diversity. By increasing forage potential and maintaining snow-shedding capabilities, local deer populations could remain stable even in heavy snow years.

The Proposed Action would not substantially impact threatened, endangered, proposed, or sensitive species, nor would it impact populations or viability of MIS, species of concern, or any other wildlife species or habitats. In summary, indirect effects include improved habitat quality over time and direct effects include temporary disturbance to individuals and habitat for MIS, species of concern, and migratory birds.

Effects to wildlife habitat are expected to be beneficial in the long-term. Habitat quality would increase as vegetation composition and structural diversity increases. The larger surface area rehabilitated will provide the greatest overall benefit to wildlife species.

Direct effects include temporary disturbance of wildlife that may currently use the area for traveling, feeding, resting, or reproduction such as black bear, and migratory birds. In the short-term, removal of vegetation may provide temporary disturbance and reduction of cover in foraging habitat for black bears. Following restoration efforts, increased riparian vegetation will enhance foraging habitat over time. Disturbance due to restoration work may cause some wildlife species to avoid the area during the periods of ongoing work. Restoration of the stream channel will improve salmon spawning habitat, which will benefit species that feed on salmon such as black bear, bald eagles, gulls, wolves, marten, and other birds and mammals.

Indirect effects of rehabilitation include increase in habitat quality, as diversity of composition and structure, and numbers of snags and downed logs increase over time. Individual tree selection and thinning, while leaving many of the dominant trees can reduce competition and enhance growth, promoting future nesting habitat and cover for a wide variety of bird species, as well as increased understory browse for deer.

Trees removed within the watershed or adjacent watersheds for instream rehabilitation may result in wildlife habitat loss due to vegetation removal and potential disturbance from construction equipment. Removal of trees may destroy existing nests, roosts, cover, or foraging areas.

## Cumulative Effects of the Proposed Action on Wildlife

Cumulative effects of the analysis (reasonably foreseeable) were not calculated for State or private lands. The Project Area does not include Corporation lands. Portions of State lands located in the lower mainstem Harris River have been subdivided in recent years. Private landowners in these areas are clearing forested lands and building homes. The Forest Service Habitat Capability Model for MIS in 2052 predicts a reduction from current deer and wolf habitat capability for the Project Area due to existing young growth entering the canopy closure stage by 2050.

## Subsistence—Direct and Indirect Effects

Subsistenc opportunities are very important to both Native and non-Native people on POW. Subsistence hunting, fishing, trapping, and gathering activities occur within the proposed action area. Effects on subsistence resources and uses important to rual communities are discussed in three caegories: abundance and distribution, access, and competition.

**Abundance and Distribution**

The Harris River Restoration Plan encompasses a geographical area that includes diverse subsistence resources such as deer, black bear, furbearers, small game, waterfowl, salmon, plants, and firewood throughout the proposed Project Area.

Community use of deer for subsistence purposes is well documented and studied for the rural communities of SE Alaska. Community use of specific geographic areas for obtaining deer is estimated by the WAAs used by the State of Alaska. The WAAs included in this Project Area have the following average deer harvest numbers: WAA 1317 (76 deer), WAA 1318 (328 deer) and WAA 1332 (67 deer).

With application of the riparian standards and guidelines on the Forest Plan, no significant adverse effects on salmon or trout species are anticipated. No significant adverse effects are anticipated for wildlife species, including deer.

**Access**

The road network on POW provides access to many areas that were previously unconnected and can affect subsistence both positively and negatively by providing access, dispersing hunting and fishing pressure, and creating the potential for increased competition. While road systems tend to bring more people into an area, roads also

provide subsistence hunters access to previously remote regions and provide a greater opportunity for subsistence harvest.

This project proposes to improve long-term access through road storm-proofing and road improvements. A slight decrease in road density may be important for wolf conservation regarding high mortality from trapping and hunting, where human access is an important consideration of the wolf conservation strategy.

Deer hunters will have access to most areas in the action area due to proposed long-term road improvements. Other subsistence hunters may prefer to hunt "non-motorized" areas to avoid other hunters and competition, therefore, the small amount of roads proposed for storage or decommissioning may improve their hunting experience or success. This analysis concludes that no significant restriction on any subsistence resource in the Project Area, from past, current and reasonably foreseeable future actions, will occur.

Overall, there would be no significant possibility of a significant restriction on subsistence use of deer, black bear, marten, wolf, otter or other wild foods as a result of the proposed action.

**Competition**

Subsistence resources are distributed across POW. The extensive road system on POW tends to disperse competition for available resources. No reduction in wildlife populations is expected due to this project or overall subsistence harvest of deer, bear, or wolves due to changes in competition. Overall long-term access into the area should be improved, due to road improvements which distributes subsistence users and decreases competition. There would be no significant possibility of a significant restriction on subsistence use of deer, black bear, marten, wolf, otter or other wild foods as a result of the proposed action.

## Cumulative Effects of the Proposed Action on Subsistence

Cumulative effects on subsistence are similar to direct effects. The harvest of State of Alaska lands by the Alaska Department of Forestry is possible in the adjacent Indian Creek watershed. Three areas adjacent to Indian Creek have been identified for potential harvest in 2009. These potential sale areas are based on aerial photos. Access to these harvest areas may occur from the lower Harris River area. Portions of State lands located in the lower mainstem Harris River have been subdivided in recent years. Private landowners in these areas are clearing forested lands and building homes. Overall, use of the Harris Watershed by subsistence users is expected to remain moderate for the foreseeable future. From a cumulative standpoint, there would not be a significant possibility of a significant restriction on subsistence use as a result of this proposed rehabilitation work. Increased spawning and rearing habitat created by the proposed action stream channel rehabilitation projects are expected to provide a long-term, net positive benefit to the fisheries resources for the foreseeable future. Rehabilitation of the stream channel will improve salmon spawning habitat, which will benefit species that feed on salmon such as black bear and other mammals. Riparian thinning will improve habitat conditions for deer and black bear.

## Recreation—Direct and Indirect Effects

Two established trails, converted from haul roads and directly related to environmental resource concerns, would be improved. Hydrologic connectivity would be restored and foot traffic across streams enhanced to meet drainage and safety concerns. In addition, trail/stream interaction would be improved with either trail bank hardening or relocation of trail. These treatments would be similar to other road improvement and bank stabilization treatment effects to the physical environment where heavy equipment is used. Additionally, unofficial Fubar Creek trail, a closed haul road contained in the riparian management area (RMA) of Fubar Creek, would be re-opened for access to instream rehabilitation treatment sites. Work completed of instream rehabilitation, would support a maintained District trail, including surfacing and stream crossing structures. This new trail would inform visitors about restoration work, its purpose and its effects.

Use is likely to increase in the Harris River resulting from improved trails, but the recreation and fisheries pressures are not expected to exceed standards for recreation use in the area. In addition, by converting the closed Fubar Creek Road to an improved trail, the fishing and recreation use may be spread out between the Harris River and Fubar Creek trails. Thus, the effect may be to have more users but fewer visitor contacts with each other.

The 2025100 road is a tributary road to the Twentymile Trail and is only accessible by pedestrians. This road is not part of the maintained Twentymile Trail and receives very little use. Stormproofing treatments of road 2025100 may deter some visitors from accessing clearcut areas and closed mining sites up in the steep sub-basin. Visitors accessing clearcut areas along the abandoned 2025100 would find multiple waterbars to traverse. Excavated fill material would be stockpiled along cutbank such as to minimize impediment of foot traffic, but users would still have to climb down and out of excavations at their own risk and with additional effort.

Renovations to Road 202500, which leads to the Twentymile Trailhead, would create a safer and more comfortable drive to the recration trailhead. A small use level increase to Twentymile Trail is likely due to the road improvements.

The One Duck Trail is located within the Harris River Restoration Project Area. This trail is slated for reconstruction in 2008-2009, depending on funding availability. One Duck Trail reconstruction would provide a safer ascent to the top of the Indian Creek watershed. Although these improvements would create better drainage, the reconstruction is not likely to have an effect on the Harris River, its tributaries or the restoration project.

The reconstruction or relocation of trails would limit use for the short period of reconstruction, but would eventually increase use in the area through the trail improvements. The increase in use is not likely to be significant because it would not exceed the standards determined by the land use designation and recreation opportunity spectrum (ROS) classifications. Furthermore, the trail restoration work would improve human health and safety conditions, coordinate with fish and wildlife initiatives and

enhance an existing recreation opportunity, keeping with Forest Plan direction (Forest Plan 4-36).

Improvements to the existing recreation sites, restoration of the Fubar Creek road, and closure of the 2025100 road fit with the planned level of recreation development for the Harris River area. The Forest Plan along with the draft Prince of Wales Recreation Management Plan identify the Harris River area as a chance to enhance existing, and provide additional, recreation opportunities to meet local and non-local visitor demands. Members of the public during meetings held in Prince of Wales communities, expressed interest in expanding recreation opportunities in the Harris River Valley. They also showed an interest in reconstructing the Harris River Trail and Trailhead to improve the existing opportunity. Based on the Forest Plan direction demonstrated by the LUD and ROS classification and the encouragement of local stakeholders, it is unlikely that the actions associated with the Harris River Restoration Project would have significant cumulative effects on the recreation resources of the area.

Increased traffic, dust, noise, smell, visual distraction, water turbidity, construction equipment, and safety concerns associated with stream rehabilitation activities could have short-term direct effects on recreation users. The improvement of two established trails would improve foot traffic across streams would be enhanced to meet drainage and safety concerns. Bank hardening and/or trail relocation would improve trail/stream interactions. Designating the Fubar Creek Trail from the decommissioned 2024050 (south) road would provide a maintained trail through Fubar Creek to the Harris River mainstem. This new trail would inform visitors about rehabilitation work, its purpose and effects. A direct effect would be the increased emphasis on educating the public through interpretation.

Machinery operating within the river channel, along roads to be placed into storage, and chainsaw thinning activities within riparian areas could cause short-term indirect effects to recreationists. Unexpected loud noises, smells and even the sight of large machinery have the potential to spook an animal causing them to rear up and run away. An indirect effect of stream restoration is the potential for the temporary displacement of recreational users to other drainages on the island during implementation of the rehabilitation projects. An indirect effect of stream restoration is the potential for an increase in salmon populations that would potentially attract more people and bears to the area than there are now. By reopening the Fubar Creek trail, the fishing and recreation use may be spread out between the Harris River and Fubar Creek trails.

## Cumulative Effects of the Proposed Action on Recreation

The rehabilitation projects would create the short-term direct effects of increased construction equipment in the watershed, noise and smells from machinery along roads proposed for storage, trail improvements, and for instream rehabilitation work. These effects combined with the short-term effects described above would directly affect recreational users who access the project area. Upon completion of all these projects, these effects would subside.

Developed recreation improvement projects are planned for the One Duck Trail in 2008-2009. Improvement to the Harris River Trail and Twenty Mile Trail are part of this analysis. This project has the potential to displace some trail users during construction. This displacement of recreational users may increase pressure on trails in other areas on

the island. The long-term effects of the rehabilitation projects include improved trail systems and new interpretation opportunities in the watershed.

## Heritage—Direct and Indirect Effects

Consideration of the effects of the proposed project on heritage resources in the "area of potential effects" is a process defined by the National Historic Preservation Act (1966 as amended). The process consists of (1) defining the area of potential effects, (2) conducting a review of existing historic and archaeological information about the project area including the results of past heritage surveys, and through consultations with affected tribes and groups, (3) implementation of any additional fieldwork deemed necessary to assess potential effects, (4) development of recommendations based on the results of 1, 2, and 3, and (5) consultation with the State Historic Preservation Officer to achieve concurrence with recommendations regarding significance and effect. The Alaska Region of the Forest Service, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation Programmatic Agreement (Agreement # 02MU-111011-176) establishes the National Historic Preservation Act Section 106 review process for certain types of projects. For projects that are found to contain no historic properties within the area of potential effects, the Forest Service may authorize project clearance after completing and documenting the analysis process. Under the terms of the Programmatic Agreement completed reports are forwarded to the SHPO annually for programmatic review.

The Harris River Watershed Rehabilitation Project is a group of relatively small scale projects located in different parts of the watershed. The area of potential effects for heritage resources is considered to be only the area of direct effects for each project, rather than the watershed as a whole. The projects analyzed in this plan generally present little risk to historic properties, known or yet undiscovered. The cumulative and indirect effects are considered negligible.

Archaeological survey and research in the project area by the Forest Service has been very limited. Forest Archaeologist, Chris Rabich Campbell, conducted archaeological test excavations in 1984 at the site of the Maybeso Bridge crossing. Test pits on three recognized river terraces and survey of the modern floodplain and gravel bars did not result in recording of any cultural sites (Campbell 1984). Portions of the planned Klawock/Hollis Highway were surveyed in the early 1980s. In 2005 archaeological reconnaissance was conducted for the Fubar Creek Restoration Project (Hankins and Fifield 2006) and the Upper Harris River Partial Barrier (Carlson and Fifield 2006). No cultural resources were noted in any of these investigations. Two historic sites are documented in the project area.

Although there has undoubtedly been extensive use of the project area by Alaska Native people including the construction of shelters and camps, there are very few recorded archaeological sites in the area. This is attributable principally to two factors. Very little archaeological survey has been conducted in the assessment area. Mining and timber extraction were conducted prior to the enactment of cultural resource laws. Secondly, the industrial and residential activities related to mining and timber harvest in the watersheds of the project area affected the areas most likely to contain earlier sites. Modern

buildings were built on the sites where old camps once stood. Stream mouths attracted modern interests as they did in the past.

## Cumulative Effects of the Proposed Action on Heritage

Classes of historic and archaeological sites (heritage resources) that might be expected to occur in the Harris River Project Area include (1) Native fishing structures (in stream) and associated camps (possibly in stream terraces), (2) remnants of historic trails represented by patterned blazes or trail tread, (3) historic mining roads, adits, and camps, and (4) historic logging roads, structures, and equipment.

Appendix C of the Region's Programmatic Agreement with SHPO and the Advisory Council (USDA FS 2002) stipulates certain classes of undertakings have little to no potential to affect historic properties because of their nature or size. The heritage specialist will determine if the undertaking meets the conditions of one or more of the following classes. The Specialist will determine the level of inspection, monitoring, or other identification necessary. The following examples are listed.

1. Activities in locations where previous natural or human disturbance has modified the landscape so extensively that the likelihood of finding a heritage resource is negligible. A field inspection may be needed to determine if the disturbance itself may be of historic importance. An example would be expansion of vertical quarries.
2. Heavy maintenance, reconstruction, or replacement of existing facilities in areas that have been previously inventoried to current standards, provided that the facility is either less than 50 years old or has been determined ineligible for listing in the National Register. The facility cannot be located within a National Historic District and such work must not affect any nearby historic properties. Examples may include buildings within administrative sites, recreation cabins, and facilities within developed recreation sites.
3. Watershed restoration activities that address road erosion and sedimentation with road decommissioning activities for roads less than 50 years old; such as removing culverts, decompacting road surfaces, recontouring road surfaces, waterbarring, stabilizing unstable fills, and mulching, seeding, and planting native vegetation as needed.
4. Road or trail closures accomplished with gates, barricades, berms, and/or waterbars.
5. Resource activities where minimal ground disturbance will occur and where no properties 50 years old or more are involved. This activity type may include timber stand improvement and precommercial thinning, single hazard tree removal, vegetative manipulation to create fire safety zones around structures, personal use wood permits, and noncommercial firewood cutting. These activities are limited to using powered or manual hand tools and heavy machinery is restricted to access that is already established. Slash burning, staging areas, and field camps are not included in this activity.

Many of the projects proposed in the Harris River Watershed Rehabilitation Project meet these criteria and may be cleared without additional fieldwork and review. Several projects would result in ground disturbance, which may require the Heritage Specialist to

make a determination of effect. The following table lists proposed projects and their status regarding Applicability of FS/SHPO/ACHP Programmatic Agreement (# 02MU-111001-076, Appendix C). **Projects for which the Programmatic Agreement does not apply will require project specific NHPA Section 106 analysis and concurrence prior to implementation.**

Table 5: Harris River Watershed Restoration Projects Applicability of FS/SHPO/ACHP Programmatic Agreement: Appendix C

| Project Name | Project Type | Appendix C Applies |
|---|---|---|
| 2000220 Road Storage | Road Storage | Yes |
| 2024050 Trail Upgrade/Stream Rehabilitation | Instream – Hydrologic Connectivity/Stream Stabilization | No |
| 2024060_0.048L Road Stormproofing | Remove culverts, road storage | Yes |
| 2924080 Harris Peak Road Stormproofing | Remove culverts, road storage | Yes |
| Stormproofing | Remove culverts, road storage | Yes |
| 924_25.94R State Road Stormproofing | Remove culverts, road storage | Yes |
| 2024100 RR1 State Trail Improvement | Road Hydrologic Connectivity-Public Safety – install culverts | Yes |
| 2024110 Hydrologic Connectivity Restoration | Install culverts – existing road | Yes |
| 2024185 Road Stormproofing | Remove culverts, road storage | Yes |
| 2025000 RR1 Hydrologic Connectivity Restoration | Install culverts – existing road | Yes |
| 2025000 RR2 Trail and Stream Bank Stabilization | Install culverts | Yes |
| 2025100 Road Stormproofing | Remove culverts - storage | Yes |
| 2026000 & 20262000 Decom/Storage | Road storage and decommission | Yes |
| Tributary LWD Modifications and Enhancements | Instream placement of large woody debris | No |
| Fubar Creek Rehab II | Instream work – bank modification | Previously Cleared |
| Lower Harris River Mainstream LWD Structure-Bank Stabilization | Instream work – bank modification | No |
| Lower Harris River Mainstream LWD Structure-Bank Stabilization | Instream work – bank modification | No |
| Riparian Thinning and Floodplain Roughening | Riparian thinning | No |

## Scenery—Direct and Indirect Effects

This section will address visual effects relating to the implementation of the rehabilitation projects discussed in this document. Projects of particular concern to scenery resources in this document are thinning, trail upgrades and all management activities within the Scenic Viewshed Land Use Designation (LUD). Key management activities disclosed in this document that pose potential for change to scenery resources in the project area are:

- Riparian thinning in the upper Harris River
- Wildlife thinning in the lower Harris River
- Road Storage along Hydaburg Rd (#13)
- Trail upgrades in both the Scenic Viewshed and Old Growth LUDs.

The visual resources within and adjacent to the project area were analyzed using the Forest Service's Visual Management System (1979). The Region 10 Visual Management Handbook (1985), and the Tongass Land and Resource Management Plan of 1997, as amended, hereafter referred to as the "Forest Plan".

Key indicators used to determine effects to scenery are:

1. To what extent do management activities correspond to adopted visual quality objectives (VQOs) within the project area.
2. Cumulatively are thresholds for change exceeded in the project area as a result of past and proposed management activities.

### Visual Priority Travel Routes and Use Areas

The Forest Plan includes the designation of Visual Priority Areas, such as Travel Routes and Use Areas (VPR's). There are nine Visual Priority Use Areas in the project boundary.

- Klawock Highway to Hydaburg Jct (FH#6)
- Hydaburg Jct to Hollis Highway (FH#6)
- Hydaburg Rd (#13)
- Hollis
- One Duck Trail
- Harris River Trail
- One Duck Recreation Site
- Harris River Campground
- One Duck Shelter

### Visual Quality Objectives

Forest-wide scenery standards and guidelines include Visual Quality Objectives (VQO). These objectives are measurable goals used for the management of visual resources. Visual Quality Objectives vary by land use designation and apply to any activity (including thinning) that could affect the visual character of the landscape. There are four VQOs in the project area: Retention, Partial Retention, Modification and Maximum Modification.

The majority of the project area is within Timber Production and Modified Landscape Land Use Designation (LUD). The corresponding VQO for most of the project area including Upper and Lower Harris River project areas are Modification and Maximum Modification.

The foreground corridor along Highway FH 13 Hydaburg Rd is in Scenic Viewshed LUD. Retention is the VQO in this area. Retention is highly sensitive to visual change where activities must not be visually evident to the forest visitor. If exceeded during management activities Retention objective is to be accomplished within six months following project completion.

Proposed actions in the Scenic Viewshed LUD include:

- Road Storage #2000220
- Trail Upgrade /Stream Rehabilitation #2024050

Little to no visual change as a result of road storage is anticipated. Removal of culverts and construction of waterbars/cross road drains will not be visible from any VPR. Hand seeding along cut slope banks will improve the visual condition caused by past disturbance. This action will meet Retention VQO.

Trail upgrades are anticipated to be seen from VPR Hydaburg Highway #13. On a case-by-case basis the Forest Plan allows small areas of non-conforming developments within Scenic Viewshed LUDS. Treatment descriptions include installation of a trailhead, parking area, bulletin board, sign-in box, and trail map. Currently the trail is badly damaged and is interacting with natural processes causing resource damage. Further review to evaluate recreational, fisheries, and hydrologic needs will be completed prior to the development of a detailed plan of action. Construction material and design elements such as color, scale, texture and massing will be carefully analyzed prior to implementation to ensure a non-contrasting, natural appearance. Retention VQO will be met.

Proposed actions in the Modified Landscape and Timber Production LUDs include:

- Riparian thinning in the upper Harris River
- Wildlife thinning in the lower Harris River

## Cumulative Effect the Proposed Action on Scenery

Both direct, and indirect effects caused by all proposed thinning activities in the project area described in this document will meet their corresponding Modification and Maximum Modification VQO's. Cumulatively the disturbances caused by past management activities as well as the proposed thinning activities are well within the percent allowable disturbance thresholds for change in each LUD designation.

# CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, state and local agencies, tribes and other concerned citizens during the development of this environmental assessment:

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ADF&G Div. Of Subsistence
ADF&G Div. Of Wildlife Conservation
ADF&G Sport Fishing Division
Advisory Council Historic Preservation
Alaska Coastal Management Program
Alaska Dept. of Environmental Conservation
Alaska Dept. of Natural Resources
Alaska Dept. of Transportation
Alaska Div. Of Govt. Coordination
Alaska Office of the Governor
Alaska State Historic Preservation Office
City of Coffman Cove
City of Craig
City of Hydaburg
City of Kasaan
City of Klawock
City of Thorne Bay
Community Council of Hollis
Craig Public Library
Edna Bay Fish & Game Advisory Committee
Federal Aviation Administration

Federal Highway Administration
Hollis Public Library
Hollis Community Counsil
National Marine Fisheries Service
NOAA Office of Policy and Strategic Planning
Office of the Governor
Point Baker Community Council
Thorne Bay Community Library
Tlingit & Haida Central Council
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Fish and Wildlife Service

## Tribes

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Klawock Cooperative Association (KCA)
Hydaburg Cooperative Association (HCA)
Organized Village of Kasaan (OVK)

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# REFERENCES

Ames, K. and H. D. G. Maschner 1999. *Peoples of the Northwest Coast: Their Archaeology and Prehistory*. Thames and Hudson.

Alaback, Paul B., Plant succession following logging the Sitka spruce-western forest of southeast Alaska. Ecology 63:1932-1948.

Arndt, K.L., R.H. Sackett, and J.A. Ketz . 1987*A Cultural Resource Overview of the Tongass National Forest, Alaska*. Report to the Tongass National Forest, Regional Office, Juneau, A.K., under Contract #55-0109-6-00203.

Barr, Brian. 2004. *Harris River Basin Road Assessment*. USDA Forest Service district report. Tongass National Forest, Craig Ranger District.

Bishop, Daniel M.; Stevens, Mervin E. 1964. *Landslides in logged areas in southeast Alaska*. USDA Forest Service Research Paper NOR-1. Northern Forest Experiment Station, Juneau, Alaska; 18 p.

Campbell, C.R., 1984, *Field notes, timber planning files. Ketchikan Area, Tongass National Forest*. Tongass National Forest, Ketchikan Area. On fole at the Craig Ranger District, Tongass National Forest.

FS/SHPO/ACHP Programmatic Agreement. 2002. *Second Amended Programmatic Agreement Among The USDA Forest Service, Alaska Region, The Advisory Council on Historic Preservation, and The Alaska State Historic Preservation Officer Regarding Heritage Resource Management on National*.

Goldschmidt, Walter R. and Theodore H. Haas 1998*Haa Aani Our Land: Tlingit and Haida Land Rights and Use*. Edited and with an introduction by Thomas F. Thornton. University of Alaska Press and Sealaska Heritage Foundation. (Originally published as "Possessory Rights of the Natives of Southeast Alaska", 1946)

Gomi T, Sidle RC, Swanston DN. 2004. *Hydrogeomorphic linkages of sediment transport in headwater streams, Maybso Experimental Forest, southeast Alaska*. Hydrological Processes. 18, 667-683

Hankins and Fifield 2005. Archaeological Analysis in Support of the Fubar Creek Restoration Project. *Heritage Resources Report R2005100551005*, on file at the Craig Ranger District, Tongass National Forest.

Hanley, Thomas A., Robbins, Charles T., and Spalinger, Donald E. Forest habitats and the nutritional ecology of Sitka black-tailed deer: A research systhesis with implications

for forest management. March 1989. USDA Forest Service, Pacific Northwest research Station, General technical Report PNW-GTR-230.

James, G. A. 1956. *The physical effect of logging on salmon streams of Southeast Alaska.* Alaska Forest Research Center, USDA Forest Service, Station Paper No. 5.

Jones, J. A. 2000. *Hydrologic processes and peak discharge responcse to forest removal, and regrowth, and roads in 10 small experimental basins, western Cascades, Oregon*. Water Resources Research, Vol. 36, No. 9, 2621-2642.

Lassettre, N.S. and R.R. Harris. 2001. *The Geomorphic and Ecological influence of large woody debris in streams and rivers.* University of California, Berkeley.

Mayn, Cole M. 2003. *Landslide Inventory and Investigation of Potential Sediment and Gravel Inputs to Fubar Stream [Creek], Fubar Watershed Erosion Assessment*. USDA Forest Service, Craig & Thorne Bay Ranger Districts

McGreer, Dale J.2000. *Effects of Forest Harvesting and Roads on Streamflow Processes and Application to Watersheds of Southeast Alaska*. Western Watershed Analysts Report Prepared for Sealaska Corporation

National Forest Landscape Management, Volume 2, Chapter 1, the *Visual Management System*, USDA Handbook No.462

Price, Tim. 2004. *Harris River Watershed Assessment*. USDA Forest Service district report. Tongass National Forest, Craig Ranger District.

Region 10 *Landscape Management Handbook*

Rowan, Jonathan 1998, Interview conducted in Klawock, Alaska, August 8, 1998

Shapely, Philip and Daniel Bishop. 1965. *Sedimentation in A Salmon Stream*. J. Fish. Res Bd. Canada.

Swanston, Douglas N, Daniel A. Marion. 1991. *Proceedings of the Fifth Federal Interagency Sedimentation Conference*. Volume 2. 10-49 p.

USDA Forest Service, 1997. Gifford Pinchot National Forest, *Wind River Ranger District Mining Reach of the Wind River Stream Channel and Riparian Restoration Project Area Analysis.*

USDA Forest Service. 1997. *Tongass Land Management Plan Revision, Final Environmental Impact Statement* (R10-MB-338b).

USDA Forest Service 2006. Tongass National Forest, Craig Ranger District, Harris River Restoration Plan

USDA Forest Service 2002, *Programmatic Agreement Among the United States Department of Agriculture, Forest Service, Alaska Region; the Advisory Council on Historic Preservation; and the Alaska State Historic Preservation Officer regarding National Historic Preservation Act*, Section 106 Compliance in the Alaska Region of the Forest Service, United States Department of Agriculture. Agreement # 02MU-111001-076.

# APPENDIX A: PROJECT DESCRIPTION

## Fubar Creek Phase II

| | |
|---|---|
| Stream Reach: | Fubar Creek |
| Project Area: | Harris |
| Feature Dimension: | 2,900 feet |
| Priority: | High |

**Location Description**:
Fubar Creek is located in the northern headwaters of the Harris River watershed. The Fubar Creek Phase II project area consists of the lower 2,900 feet of the stream (from confluence of Harris River Mainstem, upstream 2,900 feet.

**Reach Overview**:
This reach of Fubar Creek has been directly affected by upstream landslide events and rehabilitation efforts. Sedimentation, bank instability, low large wood component, very low recruitment potential are the issues of concern.

**Treatment Description**:
Work mainly involves protecting riparian vegetation, stabilizing eroding banks, and improving aquatic habitat. Minor channel reconstruction along 2 short reaches is planned to improve sediment transport and improve aquatic habitat in those sections. Work consists of the placement and construction of engineered log jams and large woody debris at strategic locations along the channel to stabilize of bank and habitat improvement. Large woody debris (LWD) would be placed on the floodplains adding roughness and protecting riparian vegetation that help maintain a stable stream corridor. Two short stream reaches would be reconstructed (~600ft total) by increasing the existing channel length and adding or reinforcing existing meander bends with engineered log jams.

Materials for log jams would be collected on Forest Roads 2026000 & 2025000, 2024050 (east), 2024300, and 2016000. Approximately 150 trees will be required for the project. Borrow material for the project would utilize material from existing quarries and materials on from the same road systems above.

Project access would be along an existing legacy Forest Road 2024050 (east) that runs along the Fubar Creek corridor. Approximately 1,500 feet of temporary access road would be constructed to move trees and boulders to the work sites. The existing Forest Road surface would be cleared of vegetation and temporary drainage structures would be added as required to maintain water quality and aquatic passage, and a surfacing of course quarry rock would be placed to provide a stable surface. After completion of the project, temporary access roads would be removed and re-vegetated. The reconstructed Forest Road 2024050 (east) would be left heavy equipment accessible access until the Fubar Creek Phase II and Harris River mainstem projects are complete. Once work along the Harris River is completed the road would be placed into storage and improved for trail conversion and interpretation.

## 2024050 (South) Decommision/Trail Designation & Improvement

Stream Reach: Fubar Creek
Project Area: Fubar
Feature Dimension: 3,700 feet
Priority: High

**Location Description**:
Fubar Creek is located in the northern headwaters of the Harris River watershed. The Fubar Creek Phase II project area consists of the lower 2,900 feet of the stream (from confluence of Harris River Mainstem, upstream 2,900 feet.

**Reach Overview**:
Old road bench of the 2024050 (South) remains mostly intact with drainage structures removed. Fubar Phase II would reopen road for heavy equipment.

**Treatment Description**:
Utilizing heavy equipment on-site during Fubar Phase II close-out, improve road surface and construct drainage structures for pedestrian traffic. Create and install interpretive sites that explain instream rehabilitation and watershed processes.

## 2026000 Decommission

**Road Number_Reach:** 2026000_RR1
**Project Area:** Upper Harris
**Feature Dimension:** 0.68 miles
**Priority:** High
**Location Description:**
This road reach is specific to the last third of the 2026000 road. It begins at the junction with 2026200 and extends 0.68 miles to the end of the road.

**Reach Overview:**
All of road 2026000 is closed to public traffic by a gate at the junction with the Klawock-Hollis Highway. The road reach existing conditions include cutslope erosion along most of the inboard side of road, culvert damage and/or plugging, cracking, sliding/slumping of outboard fill. The road reach is experiencing multiple mass fill failure. Near road end, road has captured a shallow debris slide which fills road surface. Deep scarps (slope failure headwalls) prevent vehicle passage not far beyond first landing (see site descriptions. The failing outboard edge (OBE) results in hazardous drivability. This section of the road is actively eroding and lies along a steep side slope.

**Treatment Description:**
Decommission road and change management objective to represent change in status. Pull all CMP's (see exception in site descriptions); relocate landslide material to stable location; pull OBF of road end landing; and pull back unstable road fill material as indicated. Seed entire road length and bare soil cutbanks; 20'W X 3587'L=71740ft^2=1.7ac. Stockpile spoils against stable cutbanks. Some spoil may need to be end hauled to local landing, not more than 1,000'. Outslope last 2,112' of road reach, site 0670 to 0681.

Remove CMP: 8
Install waterbar: 11
Install cross road drain: 9

Total fill removed: 3,467 CY
Outslope: 2,112'

Notes:
* Stockpile no fill or debris along OBF.
* Directional orientation downslope.
Abreviations:
DRC=ditch relief culver; OBF=outboard fill; IBD=inboard ditch; CB=cutbank; WB=waterbar; CY=cubic yards; XRD=cross road drain; CMP=corrugated metal pipe

**2026200 Road Storage**

**Road Number Reach:** 2026200_RR1
**Project Area:** Upper Harris
**Feature Dimension:** 1.37 miles
**Priority:** High
**Location Description:**
This road begins at the junction with 2026000 and extends approximately 1.2 miles.

**Reach Overview:**
Road 2026200 was built along a steep side slope. The first section climbs up a steep gradient, then the road levels off. The road is drivable; all culverts are still in place. The current conditions of the road include sediment accumulation in some culverts, fill slump or slide failure, and missing structures. Due to the unstable steep slopes that the road cuts across, this road has high road failure potential.

**Treatment Description:**
Store road by removing all structures and pulling back fill from OBE (along approximately 60% of road). Place waterbars/cross road drains where needed. Stockpiles spoils locally, spread against cutbanks (no excavated material on road surface). One crossing would require a temporary rebuild of deep crossing to access end of road.

-remove CMP: 24
-install waterbar: 13
-install cross road drain: 23
-total fill removed: 526 CY
-total landing fill removed: 160 CY
-total channel re-establishment: 70'

**2000220 Road Storage**

**Road Number Reach:** 2000220_RR1
**Project Area:** Harris
**Feature Dimension:** 0.61 miles
**Priority:** Med

**Location Description:**
Road 2000220 is located in the Harris River watershed just north of one-duck pond in the Fubar Creek Headwaters. The road length is 0.61 miles.

**Reach Overview:**
This is an objective maintenance level (OBML) I road. The road was built for a timber harvest in the upper Fubar Creek sub-basin. Most of the road is drivable. Vegetation is overgrown onto road prism. The concerns on this road include failure of outboard fill failure, stream water diverting down road prism, ditch plugging, and landslide and fill failure at terminal of road. The beginning of the road cuts through a low gradient muskeg area and enters into steep unstable side slopes that overlook Fubar Creek. A landslide has occurred at the very end of the road. Proper storage measures should be taken to avoid potential landslide activity elsewhere along the road.

**Treatment Description:**
Properly store road. Remove all culverts and construct waterbars/cross road drains. Stablize cutbanks and fillslopes. Hand seed along cutslope banks.

- remove 5 culverts
- install 5 Waterbars
- install 9 cross road drains
- ground seed 4,120 cu ft cutbank

**2024110 Decommission and Hydrologic Connectivity Restoration**

**Road Number_Reach:** 2024110_RR1
**Project Area:** Harris
**Feature Dimension:** 1.54 miles
**Priority:** Med-High

**Location Description:**
Road 2024110 intersects with road 2024100 on State land. Most of the 1.5 mile road is on National Forest land and runs along the right footslope to the Harris River.

**Reach Overview:**
Road 2024110 lies at the footslope of the floodplain area of the Harris River. Runoff from the adjacent slopes is causing pooling in ditches and on the road surface. The road cuts across a steep slope and displays much deterioration with several areas of road cracking and sliding downslope. Road has many stream diversions and failed drainage structures. Water is ponding and is saturating the road fill. Although the road is significantly affecting the hydrology of the hillside runoff, road bench remains mostly intact with a few minor outboard fill (OBF) failures. Trees blown down on or near the road are uprooting road surface in places. Several landslides occur on the road surface, and one large landslide has blown through road. No heavy equipment accessible to site.

**Treatment Description:**
Pull back outboard fill along the road (heavy equipment treatment only). Install cross road drains and waterbars along entire road reach as specified. Remove wooden/log culverts and replace with waterbars. Install waterbars at all stream crossings. Use blasting techniques for excavation of material at cross-road drain and waterbar sites. Use hand crews to dress blast sites. Slumping fill site would not be able to be treated without heavy equipment.

-20 total waterbars blasted. This includes 8 log culverts and 1 log bridge structure. Remaining waterbar blasting sites are fill or original drainage structure is beyond detection.

## 2024050 (North) Harris River Trail Upgrade/Stream Rehabilitation

**Road Number_Reach:** 2024050_RR1
**Project Area:** Harris
**Feature Dimension:** 1.42 miles
**Priority:** High

**Location Description:**
Road 2024050 is located in the Harris River drainage. It begins at the junction with the Craig-Hollis highway and extends along the Harris River ending at the junction with the Hydaburg highway.

**Reach Overview:**
Harris River Trail: Classified road 2024050 is a non-drivable haul road that was constructed down onto the floodplain of the Harris River. The road has subsequently been closed and converted to a trail. As the trail nears the floodplain, interaction with a steep ephemeral stream has caused significant erosion of the road fillslope until the road captures the streamflow that sends the stream braiding down and across the road and alluvial fan. The road surface is deeply eroded and continues to degrade. Once down to the mainstem, the trail fords what is now a large back channel of the Harris River and continues down the length of a mid-channel island until reaching the mainstem proper (the back channel was once mainstem). This section has had most drainage structures removed. The one remaining structure has failed and is collapsing as the mainstem erodes the adjacent bank. The trail is badly damaged and is interacting with natural processes causing resource damage. The trail needs further review to evaluate recreational, fisheries, and hydrologic needs to determine a more detailed plan of action.

**Treatment Description:** Stabilize class I stream upstream of diversion by incorporating stable LWD, willow stakes in raw banks, and large rock to protect trail adjacent to bank erosion sites. Establish stable channel across trail and to left of trail while providing access to floodplain. Construct small footbridge across new channel and reconstruct trail to island crossing. Install rip rap at island bank erosion site to protect bank and trail while allowing through flow. Install trail markers at stream crossings and island end. Install Forest Service bulletin board, sign-in, and trail map at beginning of trail. Install bank stabilization LWD structure at head of island for 80 feet and install grade control structures at backchannel inlet to allow sub-bankfull flow to enter channel. Trailhead and parking area located on paved highway will be improved by State highway projects.

-Multiple LWD structures: Jams & grade control structures
-155 linear feet of rip rap
-One 20 foot footbride/interpretive platform
-One 100 foot footbridge

## 2025100 Road Storage

**Road Number_Reach:** 2025100_RR1
**Project Area:** Harris
**Feature Dimension:** 0.84 miles
**Priority:** High

**Location Description:**
From Harris River campground, east 0.3 mile, head North on 20-mile road (2025000) for 1.8

miles. Road ends at trailhead. From trailhead, cross footbridge for 0.2 mile. Junction with 2025100 on left (east).

**Reach Overview:**
Road 2025100 is a 0.82 long objective maintenance level one road that is accessed from the 20 Mile trail almost 0.2 mi from trailhead. Footbridge at trailhead crosses class 1 stream. The 2025100 road accesses two 1995 harvest units. Road has all culverts in place apart except for one deep fill stream crossing at milepost 0.59. This crossing would have to be rebuilt to access remaining road that includes 8' diameter pipe stream crossing. Blow down is dispersed in pockets along road. Road is mostly intact, but some structures are plugging with potential for diversion. YCC hand crew cleared plugged pipes inlets in 2006.

**Treatment Description:**
Store 0.82 miles of road by removing undersize CMP's, installing waterbars, and stabilizing fill material.

-Mobilize across class 1 stream: one entry, one exit
-Buck and remove/sidecast blow- down across road
-Excavate and remove up to 14 culverts, including large fill crossing
970+
CY 8' diam on valley mainstem channel
-Install approximately18 waterbars
-Install 2 cross drains
-Install temp 36" pipe
-Clean 1 cmp
-Clear inboard ditch, 50'

**2025000_RR1 Maintenance and Hydrologic Connectivity Restoration**

**Road Number_Reach:** 2025000_RR1
**Project Area:** Harris
**Feature Dimension:** 1.84 miles
**Priority:** Low-Med

**Location Description:**
Mainline road 2025000 is accessed at mile post 20 along the Klawock-Hollis Hwy. The road reach begins at the junction with the Klawock-Hollis Hwy and extends 1.84 miles along the upper Harris River through forested wetlands and muskegs.

**Reach Overview:**
This road provides access from the main highway to 20 Mile Trail trailhead in the upper Harris River. The road was originally constructed in the early 1960's for logging purposes. The current conditions include stream diversions down road prism, plugged and failed culverts, and sediment accumulating in inboard ditch. Due to the easy accessibility and frequent use of road system, and its proximity to the Harris River, these conditions are causing increased risk of public safety from failed structures and contribute to altered hydrologic connectivity.

**Treatment Description:**
Road 2025000 RR1 is in need of basic road maintenance and drainage structure upgrades. Upgrade wood culvert, replace damaged, undersized, or rusted out drainage structures, and regrade surface. Install new drainage structures at all diverted stream crossings.

## 2025000_RR2 Trail & Stream Bank Stabilization

**Road Number_Reach:** 2025000_RR2
**Project Area:** Harris
**Feature Dimension:** 2.80 miles
**Priority:** Med

**Location Description:**
This road reach includes the upper (non-drivable) section of the 2025000 classified road system. It extends 2.8 miles along the upper Harris River.

**Reach Overview:**
Road 2025000_RR2 is an old logging road constructed in the early 1960's, later converted into a Forest Service trail. Timber harvested along and adjacent to the riparian zone of the upper Harris watershed was harvested throughout the 1960's. A footbridge was built at the near the trailhead, permitting hikers to cross a class 1 stream. Small wooden structures have been placed over most removed culvert sites.

A bridge has been removed from a class 2 stream crossing. The upper most section of the road is washed out in several places due to changing course of the Harris River. Current conditions include water pooling in the ditchline, stream diversions running down road prism, and scoured out sections of road system. These conditions have resulted in stream channel alterations and degraded fish habitat downstream.

**Treatment Description:**
Trail system maintenance from the footbridge (2025000 MP 1.82) to MP 3.0. The stream crossings are functioning but wood structures over waterbars need replacement. Two log culverts need removal and replacement with waterbars/wooden foot bridges. Waterbar placement is needed where water is routed onto road and diverting down the prism. A small section of the road prism needs fill stabilization along the outboard edge. Beyond MP 3.098, the Harris River intercepts the trail in several places. The trail is not maintained after this point (A sign may be needed to tell visitors that trail is no longer in use or maintained).

Most treatment sites and descriptions are based on RCS data. Individual treatments sites should be revisited to confirm problem and course of action. Treatments listed are minimum actions needed.

## Upper and Lower Harris River Mainstem Large Wood/Bank Stability and Sediment Routing

**Project Area:** Harris
**Project Dimension:** 5.0 miles
**Priority:** High

**Location Description:**
Lower Harris River sub-basin and are focused on mainstem attributes.

**Reach Overview:**
Many reaches of the Upper and Lower Harris River are characterized by sedimentation processes. Long homogeneous reaches with increasing width to depth ratio are destabilizing banks and are causing channel avulsions across the floodplain. Most of the mainstem riparian

area was harvested in the mid-1960's, leaving little in the way of floodplain roughness, bank root strength, and recruitable instream large wood. Gravel extraction has also taken place along the floodplain as part of the original road construction. These gravel borrow ponds have captured the Harris river in several locations. The result of these processes is a decrease in instream habitat and complexity subject to frequent bedload shifts, braiding, algal blooms, and increased sensitivity to high water temperatures.

**Treatment Description:**
Treatment would include embedded LWD revetments designed to protect stream banks from erosion forces in areas of channel widening in order to encourage stream velocities to transport existing bedload and increase average depth and pool formation over time. Mainstem treatments would be focused on banks and floodplains. Similar LWD projects nature typically require 300 LWD pieces per mile. Depending on the reach being rehabilitated this number may be more or less.

**Harris River Tributary Large Wood Structure and Sediment Routing**

**Project Area:** Harris
**Project Dimension:** 2.0 miles
**Priority:** High

**Location Description:**
Upper and Lower Harris River sub-basin.

**Reach Overview:**
Harvested tributaries in the Harris River have been depleted of habitat forming, sediment storing, and sediment routing large wood. Unrestrained sediment produce from hillslope processes have resulted in fast homogenous tributary reaches that increase average slope, coarsening distribution, and develop alluvial fans as they approach the floodplain of the Harris River and cause braiding and channel avulsions.

**Treatment Description:**
Treatment would mostly utilize hand equipment to add mobile large wood and construct large wood structures to add roughness elements to over steepened stream reaches for sediment storage and habitat forming structure. Large wood would be used to increase roughness to floodplains at risk of channel avulsion and to diversion channels. Large wood would also be used on the alluvial fan to assisting in the storage and routing of sediment. Material to be used for instream large wood would be taken from adjacent riparian areas with minimal manipulation. Manipulation of large wood would utilize hand equipment only.

**Harris River Riparian and Wildlife Thinning**

**Project Area:** Harris
**Priority:** High
**Location Description:**
Upper and lower Harris River.

**Project Area Overview:**
Heavy timber extraction in the Harris River riparian areas has replaced large conifers with alder stands. In addition to deciduous dominated canopy, recruitment for large wood for instream processes and floodplain roughening is mostly non-existent. Conifer regeneration is

slowed in part from the competition for light in the deciduous dominated canopy. Physical damage may also occur to young conifers from alder sway as they reach and attempt to penetrate the alder canopy. In other conifer dominated stands, trees grow close together and are in stem exclusion stage that shade out forbs that some wildlife species rely upon.

**Treatment Description:**
Untreated riparian stands would be treated for conifer release such that increased conifer productivity results. Treatments would also increase flooplain roughness through riparian thinning project that would increase floodplain resistance to channel avulsions and increase the rate of riparian conifer stand recovery. Wildlife thinning plots would target areas that would best respond to forbs generation and wildlife travel corridors.

**2024185 Road Storage**

**Road Number_Reach:** 2024185_RR1
**Project Area:** Lower Harris
**Feature Dimension:** 2.21 miles
**Priority:** Med

**Location Description:**
Road 2024185 begins at the Hollis HWY (30.7 routed milepost) and ends at a massive landslide.

**Reach Overview:**
Road 2024185 is an OBML1 road that is not drivable and not maintained for its entire length. Drainage structures have been mostly removed. A Road Condition Survey has been completed. The upper half of road is heavily covered in vegetation with drainage structures removed and water-bars installed. Outboard fill is cracking along many reaches. Below the switchback, the road is steep with multiple stream diversions running down road prisms and one crossing completely blown out.
The lower 1,500 foot length, beginning at Hollis Hwy, is owned by the State of Alaska. This road reach is steep and has diverted runoff running down road surface. A road initiated landslide from switchback above is mostly resting on road surface about 3,000 feet up the road. At a switchback 4,050 feet up the road, a short unclassified spur road runs out to a failing landing. Beyond the switchback, the road follows the contour as it ascends the slope. In this section to end, at 1.7 miles, inadequate waterbars, 2 log culverts, 2 log stringer bridges, and large sections of outboard fill are failing. Major rebuild would be required at site 0874 to access remaining road.

**Treatment Description:**
Treatment recommendation for the 2024185 road is to properly store road. Pull unstable outboard fill and stack against cutbank or endhaul to switchback. Remove all log structures and install new waterbar or reconstruct existing waterbars where appropriate.

-Install approximately 14 waterbars & 3 cross road drains
-Remove 3 log culverts
-Excavate 1,042 CY terminal landing fill, stockpile locally
-Excavate 14,392 CY unstable road fill, stockpile locally
-Re-establish 20' stream channel

**2024060_0.48L Road Decommissioning**

**Road Number_Reach:** 2024060_0.48L_RR1
**Project Area:** Harris
**Feature Dimension:** 1.64 miles
**Priority:** Med

**Location Description:** This lower Harris spur road leads down from the mainline 2024060 to the Harris River and becomes non-drivable at pulled bridge crossing. Road Reach 1 (RR1) runs from road end to pulled bridge

**Reach Overview:** Road 2024060_0.48L_RR1 is a closed shot rock non-system road. Road reach begins at road end and ends at the Harris River Stream crossing, site of pulled bridge. Lower portion of road runs across Harris River floodplain and onto the footslope at a shallow gradient. At this point, beaver are using road bench to assist in damming upslope runoff into several ponds and a waterbar. Water saturating road surface and diverting across road. All drainage structures have been removed and waterbars installed. However, ponding at inboard ditch (IBD) and diversion across road is common for entire length with minor erosion concerns.

**Treatment Description:** No access for heavy equipment. Hydrologic connectivity can be re-established. Waterbar treatments only possible through blasting. Hand crews needed to dress waterbars.

-Blast 5 waterbars.
-Blast 1 cross-road drain

**2024080 Harris Peak Road Storage**

**Road Number_Reach:** 2024080_Harris Peak
**Project Area:** Harris
**Feature Dimension:** 1.36 miles
**Priority:** Med-High

**Location Description:**
2024080 intersects with the main highway at milepost ~25.8 and crosses valley slope for 1.36 miles at a steep gradient. The lower ~0.3 mile of road is State owned

**Reach Overview:**
The road cuts through state land for the first ~1,580 feet (~0.30 mi); most of 2024080 is on National Forest land. The road runs across a steep valley side slope. Hillslope and road fill material are unstable. Landslide activity has occurred along this slope in a few places. Potential for mass movement along this road is high as determined by Forest Service scientists. Water is ponding in IBD and on road surface. The first 1/2 of road is steeper and of greater concern while hydrologic connectivity remains an issue for the latter half. Road has thick vegetation growing from its surface. Minor erosion is occurring at several locations with several road section where the road has captured and diverted streamflow. Three major landslides have occurred along the road. Harvest units have been thinned above and below road, but additional wildlife thinning opportunities exist at other locations above and below the road. Multiple fill failures exist. Road is very open at the lower end then becomes overgrown. Several log culverts remains in place near the end of the road. Many class 4 streams that never received a drainage structure and are now diverted across the road. The RCS has identified that over half of the 19 resource sites have a high urgency rating. Treatment will require

cooperation with State for access and potential treatment of there section of road.

**Treatment Description:**
All stream crossings either need to have the waterbar rebuilt or a new waterbar constructed. Inboard ditches either need to be filled or blocked. Landslide material needs to be stabilized. Unstable outboard fill material needs to be excavated and stored against cutbank. Equipment would need to rebuild road across 3 landslides to access remainder of road.

-Install 21 waterbars
-Remove 2 log culverts
-Remove 1 log bridge structure
-Install 18 cross road drains
-Pull and stockpile ~380 CY outboard fill material
-Rebuild ~320 ft of road across 3 landslide sites.
-Re-establish 20 ft of stream channel

**2024080 0.06R&RA State Road Decommission**

**Road Number_Reach:** 2024080_0.06R&RA
**Project Area:** Harris
**Feature Dimension:** 0.30 miles
**Priority:** High

**Location Description:** 2024080_0.06R_RR1 intersects the 2024080 approx. 200' above Craig/ Hollis Hwy.

**Reach Overview:** 2024080_0.06R_RR1 intersects the 2024080 approx. 200' above Craig/ Hollis Hwy. State ownership. Road leads to Dolison Mine claim. High potential for goods-for-services along road. Road was constructed up steep hillside and ends at a large fill and rock landing where a mine site is presumed. Discarded mining equipment remains on site. A large landslide has overtaken the road just prior to the landing and very minimal drainage structure has been installed resulting in concentrated flow in the IBD. A short spur road (0.07 mi) is included for this site.

**Treatment Description:** Decommission road and improve drainage around landslide stockpiling material up on landing. Note drainage from upper portion of road drains to RA spur below.

-Remove 1 culvert
-Install 4 waterbar
-Install 5 cross road drains
-Excavate and stockpile 200 CY landslide material.

**2024100_RR1 State Trail Improvement**

**Road Number_Reach:** 2024100_RR1
**Project Area:** Lower Harris
**Feature Dimension:** 0.97 miles
**Priority:** High
**Location Description:**

2024100_RR1 Trail is located on state lands and runs from end of road near Harris estuary to

listing footbridge over the Harris. "Indian Creek" road (trail).

**Reach Overview:**

The road reach from road end to footbridge at Harris River is utilized as a trail w/moderate use. Unclassified spur road at milepost ~1.5 continues forward and eventually wraps back toward the Harris River the trail/rd and becomes overgrown. Spur treatment sites are incorporated in this report. Main road turns right at this point and serves as a continuation of the trail to access the estuaries of the Harris and Indian basins. The road is bordered by dense 2nd growth. Several minor stream diversions onto trail and areas of ponding are evident. Road located in valley bottom. Footbridge is listing and deteriorating. Trailhead at footbridge is heavily utilized by anglers. Trail accesses premier fishing and hunting opportunities on the Harris and Harris/Indian Cr. Estuaries. RCS has also detected a red pipe along this road reach. Hydrologic connectivity, foot traffic, and footbridge are resources of concern.

**Treatment Description:**

Good conifer thinning opportunity. Correct stream diversions. Replace footbridge. Clear trail of surface debris. If no other treatment done, footbridge and red pipe issues need to be addressed.

## Harris River Red Pipe Correction

**Project Area:** Harris
**Project Dimension:** 6 Sites
**Priority:** Med

**Location Description:** Upper and Lower Harris River sub-basin.

| RTE_NO | Mile Post | Channel Type | % Inlet Blocked or Damaged | Pipe Width, in | Pipe Length, ft | Habitat Length, ft | Site Description |
|---|---|---|---|---|---|---|---|
| 2000240 | 0.057 | MM_MM | 0 | 24 | 30 | 71 | Class 2_2 stream crossing with a 24" perched plastic pipe. Site is located in the Harris River campground and will need to be addressed as an individual project. ***No immediate treatment is recommended due to limited upstream habitat.*** |
| 2024100 | 0.976 | PA5_PA5 | 99 | -- | 2 | 560 | Class 1_1 stream crossing with a log culvert located on State land and is part of the Indian Creek Trail in the lower Harris basin across the Harris River footbridge. Beaver activity up and downstream. Culvert is packed with sediment and debris. Coho found downstream. Assess for hand crew removal of sediment and debris as heavy equipment is not an option. Only other option will be to blast and construct a bridge. |
| 2025000 | 1.7 | | 100 | 30 | 24 | 413 | Class 2_2 stream crossing with a 30" wood culvert. Site is located on drivable portion of access road to the Twentymile Trailhead. Beaver activity upstream. Moderate to intensive hand labor can correct problem, but may be addressed as general road improvement project. Debris blocks fish passage. Install 48 inch pipe and clear pipe inlet area. |
| 2025000 | 1.86 | MM_MM | 0 | 24 | -- | 60 | Class 2_2 stream crossing with a 24 inch CMP on Twentymile Trail at intersection with the 2025100 road. Sixty feet of upstream habitat is the inboard ditch of road/trail. ***No immediate treatment is recommended***, but may be addressed in either trail improvement or 2025100 road storage projects. |
| 2025000 | 3.187 | PA5_PA5 | 90 | 9 | -- | 409 | Class 2_2 stream crossing on the Twentymile Trail. Drainage structure has been removed, however, beaver activity upstream and downstream have dammed the crossing and backwatered the stream onto road surface. ***Treatment of the site may be addressed as part of the Twentymile Trail improvement project.*** |
| 2026000 | 0.23 | HC_HC | 100 | 18 | 29 | 125 | Class 2_2 stream crossing with an 18" CMP on the "Summit" Road in the Upper Harris River. The upstream 125 feet of habitat is the inboard ditch. No fish found upstream. Water is piping through road prism. Habitat upstream and downstream is marginal. ***No immediate treatment is recommended.*** |

## 924_25.94R State Road Stormproofing

**Road Number_Reach:** 924_25.94R_RR1
**Project Area:** Harris - Dollison Mine
**Feature Dimension:** 0.21 miles
**Priority:** High

**Location Description:** Accessible from the Hollis Highway at route milepost ~25.9.

**Reach Overview:** State road 924_25.94R (2024086 unofficial designation) is a drivable road that leads to an open mine shaft. Road is accessible from the Hollis Highway at route milepost 25.9. Road skirts two large rock pits. All drainage structures are in place. Some structures are completely plugged with water running across and diverted down road. Road access mine shaft that is open and flooded during high precipitation. The open mine is a public safety hazard.

**Treatment Description:** Block road entrance for closure. Either improve drainage structures or remove and waterbar. Secure mine shaft entrance.

Maintain & Upgrade Treatment
- -Install 1 – 36" cmp
- -Clean 3 cmp inlets
- -Re-establish 20' channel above pipe inlet

Closure Treatment
- -Excavate 3 cmp's -Install 4 waterbars.

# APPENDIX B: GLOSSARY OF TERMS AND ACRONYMS

| | |
|---|---|
| Aggradation | Is the accumulation of sediment in rivers and nearby landforms. Aggradation occurs when sediment supply exceeds the ability of a river to transport the sediment. |
| CB | Cutbank |
| CFS | Cubic feet per second |
| Channel (watercourse) | An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. River, creek, run, branch, anabranch, and tributary are some of the terms used to describe natural channels. |
| CMP | Corrugated metal pipe |
| CY | Cubic yards |
| Debris torrent | Rapid movement of a large quantity of materials (wood and sediment) down a stream channel during storms or floods. This generally occurs in smaller streams and results in scouring of streambed. |
| Dewater | To remove water from (a waste product or streambed, for example). |
| Drainage basin Or basin | A part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water. |
| DRC | Ditch relief culvert |
| Encumbered Land | Federal land selected by State and native corporations for transfer of ownership. An interest or right in real property which may effect the value of the fee, but does not prevent conveyance of the fee by the owner. Mortgages, taxes, and judgments, are encumbrances known as liens. Restrictions, easements and reservations are encumbrances, though not liens. |
| Hydrograph | A graph showing stage, flow, velocity, or other property of water with respect to time. |
| Hydrologic connectivity | In an ecological context to refer to water-mediated transfer of matter, energy and/or organisms within or between elements of the hydrologic cycle. |
| IBD | Inboard (road) ditch |
| OBF | Outboard (road) fill |

| | |
|---|---|
| Precipitation | As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface. It is the common process by which atmospheric water becomes surface or subsurface water |
| Red Pipe | Surveyed culverts on streams with fish that do not allow fish migration are termed "Red" pipes. |
| Rehabilitation | To improve physical enviroment to an environemtally functioning system that supports a desired condition |
| Restoration | To alter physical environment to pre-industrial human condition |
| Riparian | Pertaining to the banks of a stream and associated vegetation type. |
| Road closure/closed road | **By order of Forest Supervisor**, traffic on Forest roads may be prohibited by any vehicle or vehicle type, type of land resource use, speed, load, weight, height, length, width, or other limitations sepcified by the order, or based on operating a vehicle carelessly, recklessly, or without regard for the rights or safety of other persons or in a manner or at a speed that would endanger or be likely to endanger any person or property. |
| Road decommission | Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded assest or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance. |
| Road storage | Remove or bypass all drainage structures to restore natural drainage patterns, add water bars as needed to control runoff, revegetate. This is intended to be the primary maintenance strategy applied on intermittent use roads during their closure cycle. In this strategy, bridges and culverts on live streams are completely removed to restore natural drainage patterns. Cross drains and ditch relief culverts will be bypassed with deep water bars but left in place to minimize the cost of reusing these roads in the future. Due to the isolated nature of the road system, which makes maintenance costly and difficult, and their infrequency of use, storage is the most appropriate strategy for these roads. **Maintenance Level 1**, closure and basic custodial maintenance, is assigned. Storage eliminates car and truck use, and discourages use by other motor vehicles. |

| | |
|---|---|
| Road stormproof | Provide water bars, rolling dips, out sloping, etc., to assure controlled runoff until any needed maintenance can be performed on the primary drainage system. Control roadside brush to maintain passage. This strategy will provide roadway features such as drivable water bars, and out sloping to control runoff in case the primary drainage system of culverts and ditches is overwhelmed during a storm event. Each culvert will be evaluated as to where the water would go if the culvert were to fail to carry the high flow. A water bar or out slope at this location will minimize the potential of erosion of long stretches of ditch line or roadway. This is intended to be the primary maintenance strategy applied to roads assigned **Maintenance Level 2**. Storm proofing may also be a useful management tool to discourage or slow travel. |
| Sediment | Fragmental material that originates from weathering of rocks and is transported by, suspended in, or deposited by water or air or is accumulated in beds by other natural agencies. |
| Sedimentation | Deposition of sediment. |
| Stream | A general term for a body of flowing water. In hydrology the term is generally applied to the water flowing in a natural channel as distinct from a canal. |
| Streamflow | The discharge that occurs in a natural channel. Although the term discharge can be applied to the flow of a canal, the word streamflow uniquely describes the discharge in a surface stream course. |
| Turbidity | Turbidity is due to suspended solids such as clay, plankton, silt, finely divided organic matter, microscopic organisms and similar materials. These solids will deflect (or scatter) light as it passes through the sample. Turbidity is a measurement of the scattered light as compared to the amount of light scattered by a standard. The more light that is deflected the higher the turbidity of the sample. Turbidity is read as nephelometric turbidity units (NTU). |
| Watershed | The divide separating one drainage basin from another and in the past has been generally used to convey this meaning. However, over the years, use of the term to signify drainage basin or catchment area has come to predominate, although drainage basin is preferred. |
| WB | Waterbar |
| XRD | Cross road drain |

# APPENDIX C: MAPS

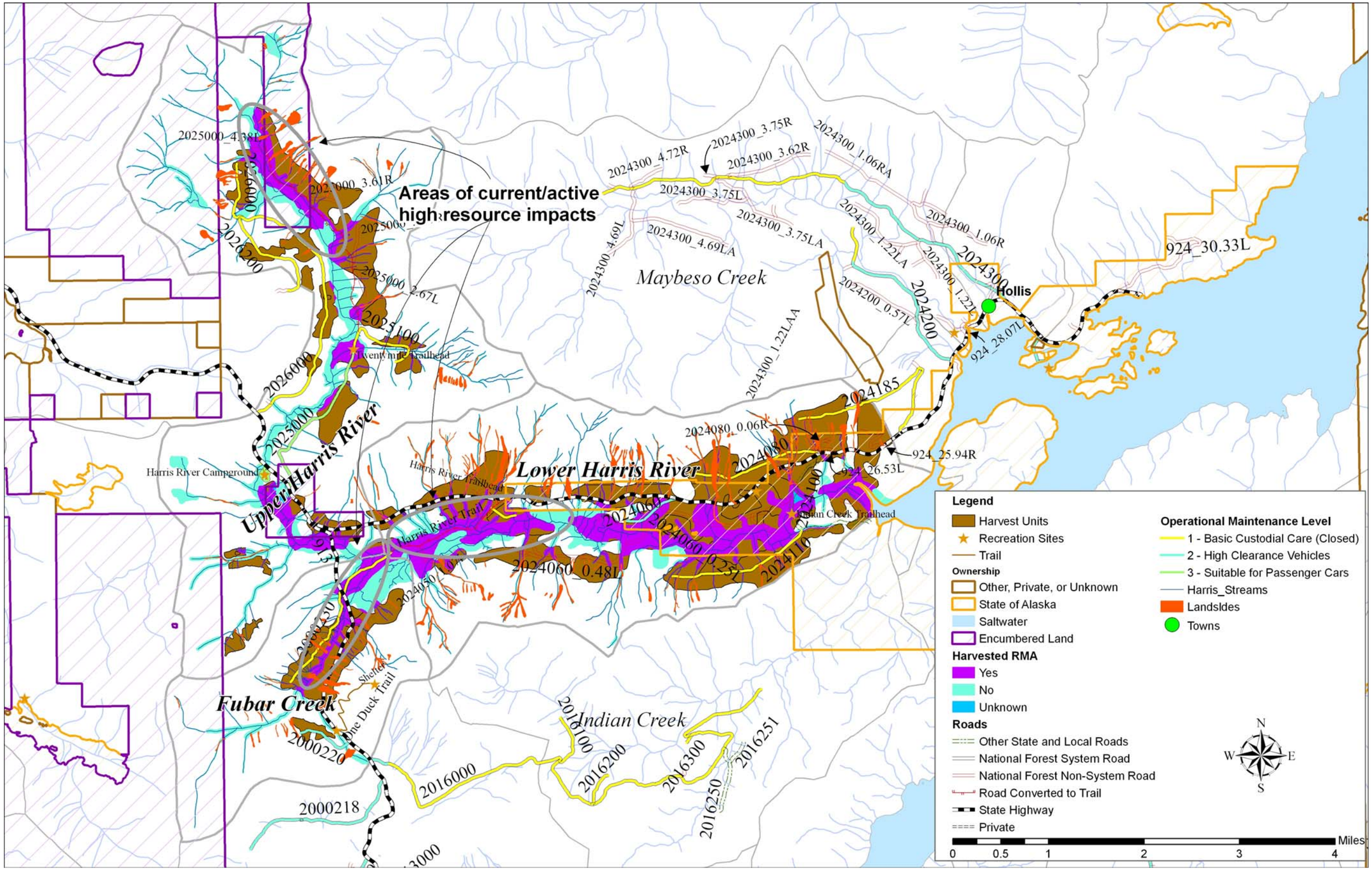
See following pages for:

Map 2. Harris River Watershed harvest units, riparian management areas, and landslide history

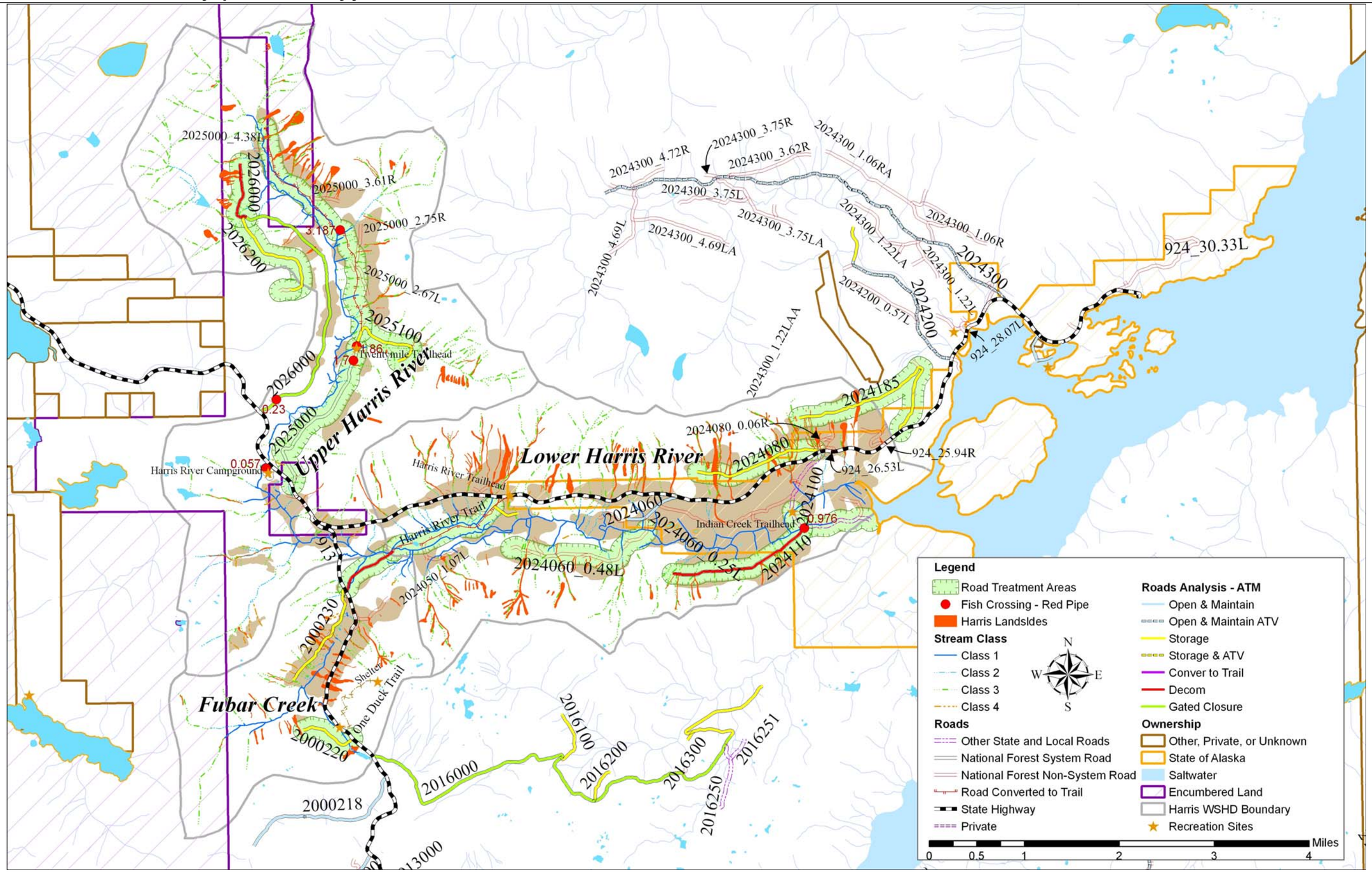
Map 3. Harris River Watershed road project areas and red pipe locations.

Map 4. Harris River Watershed proposed instream and riparian treatment areas.

Map 2. Harris River Watershed harvest units, riparian management areas, and landslide history



Map 3. Harris River Watershed road project areas and red pipe locations.



Map 4. Harris River Watershed proposed instream and riparian treatment areas.