# Final Environmental Impact Statement

## Resurrection Creek Stream and Riparian Restoration Project

**Seward Ranger District, Chugach National Forest**

**Kenai Peninsula Borough, Alaska**

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USDA Forest Service

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**Resurrection Creek Stream and Riparian Restoration Project**
**Final Environmental Impact Statement**
**Kenai Peninsula Borough, Alaska**


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**Abstract:** Resurrection Creek was home to Alaska's first gold rush just over a century ago. Stream placer deposits within the project area were mined using high-pressure water jets (hydraulic mining) during the first three decades of the 1900's. Within the project reach most of the disturbance impacts relate to hydraulic mining. Tailings generated from hydraulic mining rise to as much as 25 feet high. These tailing piles occupy the majority of the alluvial valley bottom within the project area. These tailings have disconnected or buried the historic complex of stream channels and wetlands that provided high quality habitat for salmon, bears, bald eagles, moose and other fish and wildlife species. The purpose and need for action of the Resurrection Creek Stream and Riparian Restoration Project is to accelerate the recovery of riparian areas, and fish and wildlife habitat on a 0.9 mile segment of Resurrection Creek.

The Forest Service identified the three issues during scoping. In response to issues raised by the public six alternatives were developed including the No Action and Proposed Action alternatives. Alternative 1, No Action proposes no restoration activities to take place in the project area. Alternative 2, the proposed action restores 1.1 miles of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions and enhance fish and riparian wildlife habitat on public and private lands. Restoration activities would also take place on the Haun Trust Lands for about .2 miles, as identified in a potential agreement. Two temporary bridges would be constructed. About 0.35 miles of new road construction would be required to relocate an existing section of the road to Palmer Creek out of the floodplain. Recreational gold panning would continue to be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold panning south (upstream) of the Haun Trust Lands on the project area. To interpret the mining history of the area interpretive panels would be located at the overlook area along the

Resurrection Pass Trail. A mining exhibit including interpretation, period tools, and possibly an interpreter would be located in an old mining cabin moved into the project area.

Alternative 3 would restore 0.9 miles of Resurrection Creek. This alternative includes a temporary bridge over the combined channel of Resurrection and Palmer Creeks. Approximately 0.7 miles of new road construction would occur around the east side of the Haun Trust Lands. An additional 0.35 miles of new road construction would occur to relocate Palmer Creek Road out of the floodplain. Recreational gold panning activities would continue within the project area. Interpretive signs would be installed to display information on the mining history of the area. A cooperative agreement could be developed with the Hope Historical Society to see if mining cabin and interpretive program could be created in Hope.

Alternative 4, the DEIS Preferred Alternative, would reconstruct 0.9 miles of Resurrection Creek within the project area. Access to the project would be gained through National Forest lands and an existing easement across private lands. A temporary bridge would cross Resurrection Creek and access the Resurrection Pass National Recreation Trail. The Resurrection Pass National Recreation Trail would be temporarily rerouted during construction to minimize conflicts with trail users and construction activities. Other temporary bridges would be constructed over the Resurrection Creek diversion channel and over Palmer Creek. Approximately 0.43 miles of road would need to be constructed. The Resurrection Pass Trail would be upgraded to a construction road for 0.33 miles. Interpretive programs are the same as Alternative 3.

Alternative 5 would restore 0.6 miles of the uppermost portion of Resurrection Creek on public lands and 0.2 miles of stream on the Haun Trust Lands. Access including roads and bridges would be done by the same means as described under Alternative 2. Interpretive signs would be installed to display information on the mining history of the area. Interpretive programs are the same as Alternative 3.

Alternative 6 would reconstruct a 0.5 mile portion of Resurrection Creek immediately upstream (south) of the Haun Trust. Access including roads, bridges and use of the Resurrection Pass Trail; would be done by the same means as described under Alternative 4. Interpretive signs would be installed to display information on the mining history of the area. Interpretive programs are the same as Alternative 3.

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# SUMMARY

## Proposed Action

The Chugach National Forest proposes to accelerate the recovery of riparian areas, and fish and wildlife habitat by restoring a 0.9 mile segment of Resurrection Creek on National Forest Lands. The area affected by the proposal includes portions of Resurrection Creek where placer deposits were mined using high-pressure water jets (hydraulic mining) during the first three decades of the 1900's. Most of the disturbance impacts relate to hydraulic mining. Tailings piles generated from hydraulic mining rise to as much as 25 feet high, and occupy the majority of the alluvial valley bottom within the project area. These tailings have disconnected or buried the historic complex of stream channels and wetlands that provided high quality habitat for salmon, bears, bald eagles, moose and other fish and wildlife species. The Resurrection Creek watershed is located in the Kenai Peninsula in south-central Alaska near the community of Hope. It is a tributary to the Turnagain Arm of Cook Inlet. The watershed covers 103,230 acres (161.2 sq. mi.) within the Western Kenai Mountains Eco-section, a subsection of the Kenai Mountains Section.

## Affected Environment

The tailings piles are essentially functioning as dikes that cutoff the flood flows from the original floodplain. Water velocities accelerate as they are compressed through the constricted channel concentrating the stream's energy on the streambed, simplifying substrate and degrading the channel. Sediment and nutrients are transported through the project area depriving riparian areas of soil and nutrients, which in turn retard disturbance recovery and natural succession.

Surveys of the project reach by Bair et al. in 2002 identified that mine tailings produced by placer mining nearly a century ago had significantly altered fish and wildlife habitat within the project reach by confining and straightening the stream, increasing the channel slope by 27%, and homogenizing the reach by creating a nearly continuous riffle with few pools or spawning gravel for fish. The dikes created by the mine tailings prevent fine sediment and organics carried by floods from being deposited on the floodplain, preventing natural fertilization and soil augmentation needed to reestablish vigorous riparian communities.

Both anadromous and resident fish utilize Resurrection Creek. Four species of anadromous salmonids are present in Resurrection Creek and include: pinks (*Oncorhynchus gorbuscha*), chum (*Oncorhynchus keta*), coho or silver (Oncorhynchus kisutch) and chinook or king (*Oncorhynchus tshawytscha*). Pink salmon are the most abundant species with runs estimated at 20,000 to 35,000 returning adults in even-numbered years. Chum salmon are much less numerous, with about 200 adults returning yearly. Annual coho peak counts on Resurrection Creek range from 100 to 500 returning adults. Chinook counts range from less than 100 to upwards of 500 returning adults. Spawning gravel existed only in the section of the project area where the stream was not entrenched and had access to a defined floodplain.

Large woody debris (LWD) is an important component for fish habitat. It has both direct and indirect benefits to fish species. Its role in trapping and slowing sediment movement is critical to creating spawning sites. In addition, LWD is also important in the creation of a diverse range of habitats, from pool formation to areas of high flow refuge. Bair (2002) found a greater than thirty-fold decrease in large wood in the channel at the project reach when compared to an upstream (unmined) reference reaches.

The valley bottom soils are undisturbed in very few locations, due to the historic mining. Lack of soil and soil nutrients has contributed to the lack of re-establishment of normal overstory and understory vegetation. The existing tree cover established in the margins of the tailings piles, and at the edges of the channelized stream, tends to be small, and the amount of standing dead trees and downed woody debris is low. The overall project area is characterized, aside from the tailings piles and channelized section of stream, by thick patches of reedgrass and oak fern, large patches of open, graminoid and shrub-filled areas; patches of more advanced willow/alder thickets; edge areas influenced by nearby forested cover; and damp areas with cottonwood overstory and heavy horsetail cover in the understory. Within the project area, greater tree age, species diversity, and cover complexity development is apparent in areas further from the stream channel. Forested areas near and within the project area have been affected by the spruce bark beetle infestation over the past fifteen years. Ten years following the spruce bark beetle outbreak there was a loss of species diversity and structure within the Resurrection Creek watershed (Holsten et. al. 1995). Forested stands on the east side of the project area, within the Palmer/Resurrection Creek Sale Project area (1996), are comprised mainly of dead spruce interspersed with live mountain hemlock. Formerly forested areas have converted to Calamagrostis canadensis (bluejoint reedgrass); including areas affected by the spruce bark beetle and an area that had been logged in 1985.

The project area adjacent to Resurrection Creek is composed of 74% cottonwood and 26% Lutz spruce with birch and hemlock making up only a fraction of a percent of the composition. Stand structure is in the seedling/sapling class and no large trees were observed. With the relatively young age of existing stands, snags and downed wood are virtually absent. The habitat is best for species that use early successional stages, hardwoods, and riparian areas. Lack of downed woody material makes it less than optimal for many small mammals. Lack of snags reduces the habitat quality for cavity nesting birds and mammals, and reduces quality for raptors that use snags for nesting, roosting, or perching. The adjacent slopes contain a mixture of mixed hardwoods, birch and spruce. (Bair et al. 2002). Although the disturbance occurred nearly a century ago, riparian vegetation and wildlife habitat have not recovered at a natural rate of succession. Without regeneration of riparian vegetation habitat, conditions for bears, bald eagles, moose and salmon, migratory birds, will be extremely limited within the project reach for generations to come (Bair et al. 2002). Management Indicator Species are the moose, brown bear and mountain goat. Habitat for Mountain goats does not occur in the project reach.

Humans have used Resurrection Creek spanning a period of about 10,000 years. The cultural resources in and near the project area include prehistoric and historic remains. Some of these properties are on, or eligible for the National Register of Historic Places. The historic mining resources constitute the greater part of the known cultural resources in and near the project area. Artifacts from every period of human occupation have been discovered in the region. Euro-American influence had little impact on the Turnagain Arm area until the first gold discovery there in 1890. In 1893 prospectors staked the first mining claims in the area and established mining camps at the mouths of the Resurrection and Sixmile creeks in 1895. Placer gold mining operations on Resurrection Creek began in 1888. Extensive hydraulic and hand placer mining began in 1895 and continued intermittently into the 1950s (Jansons and others, 1984). No Alaskan Native related sites are known to be located along Resurrection Creek. Only one Euro-American historic property is documented within the proposed project area.

The project area can be classified as a vernacular landscape. The historic period with which most of the cultural landscapes in the watershed are associated is the early 20th century. The features that contribute to the historic character of the cultural landscape include the physical environment and ecological systems of the region, views and vistas, mining areas, living areas, patterns of land division, vegetation and associated changes, tailing piles, ponds and ditches, the historic cabins and outbuildings, trails and roads, and indigenous and introduced vegetation. The American mining period/early Chugach Forest period (1888-1942) is one of the best-documented historic eras. Mining camps were established in proximity to streams, whose water was used for placer and hydraulic mining. There is one unpatented mining claim adjacent to the project area. A patented claim (private land) consisting of 18.54 acres is in the project area, this property is referred to as the Haun Trust Lands.

The primary recreation activity in the project area is use of the Resurrection Pass National Recreation Trail. The scenic features along the trail include alpine meadows, mountain lakes, and Juneau Falls. Cultural features include remnants of the mining and trapping era. The Resurrection Pass Trail was designated a National Recreation Trail in 1979. Nine public use cabins are accessed by the Resurrection Pass Trail. The Chugach National Forest has a long history of placer gold mining on the Kenai Peninsula. Currently gold panning, sluicing, and dredging for non-commercial purposes are important outdoor activities on the Forest, including the project area. Dispersed camping, associated with the recreational gold panning activities takes place in the project area. Currently sport fishing for pink salmon mainly occurs at the mouth of Resurrection Creek. More and more anglers are discovering the pink salmon fishing between the mouth and the Hope highway bridge.

Hope is a small, unincorporated community of 137 residents (Alaska Department of Labor, Research and Analysis 1999a) located along the southern shore of Turnagain Arm near the mouth of Resurrection Creek. . Hope was established in 1896 as a mining camp and some limited mining still occurs. The Hope Community has invested substantially into the mining history of the area. The

Hope and Sunrise Historical and Mining Museum is a prominent landmark in Hope and contains a wealth of historic mining history including several buildings, tools, photographs, and a variety of other historic artifacts. Currently, Hope has limited economic opportunities (Crone et al. 2002). The school and local retail businesses provide most of the employment in Hope (Alaska Department of Community and Economic Development 2003b). The community has a small seasonal sawmill that provides lumber mainly for local projects. Similarly, the amount of construction employment varies with projects in the area and does not usually offer year-round employment. Increases in visitors and occupancy of seasonal homes have provided some growth to the area in the retail trade, transportation, and service sectors. In the smaller, inland communities of Hope, Girdwood, Moose Pass, and Cooper Landing, residents also are involved in the commercial fishing industry.

In order to respond to damaged resources and degraded land, and to enable future decision-making regarding the uses of the watershed and its resources, the Chugach National Forest (CNF) has completed a landscape-level assessment. Landscape analysis for the Resurrection Creek watershed (Hart Crowser, 2002) has been conducted and the results documented. The landscape assessment identifies mining impacted segments of Resurrection Creek.

The proposed stream restoration area lies within the impacted habitat, between river miles 4.4 -5.8 (upstream from the mouth). In addition, this area was withdrawn from mineral entry and was identified as a potential pilot reach for restoration in the Landscape Analysis. The three main restoration and management components outlined in the 2002 Landscape Analysis document were: 1) aquatic habitat restoration, 2) vegetation restoration and 3) management, and heritage resources/human uses management.

### Public Involvement

The Notice of Intent (NOI) was published in the Federal Register on October 17, 2003. The NOI asked for public comment on the proposal from October 17, 2003 to November 16, 2003. As part of the public involvement process, the agency held previous scoping efforts. The first effort was sent on February 5, 2003, and the second was submitted to the public on June 6, 2003. Since those notices were provided to the public, the Forest Service gathered more information regarding this proposal, and determined that the appropriate level of analysis for this proposal is an environmental impact statement (EIS). The third scoping effort was conducted on October 16, soliciting public comments on the proposed EIS.

Using the comments from the public, other agencies, the interdisciplinary team developed issues to address. The issues are described below.

**Access**: Access to the stream restoration portion of the project area is a significant issue for alternative development. Several items relating to access are dependent upon whether or not there would be an agreement providing access through the Hauns Trust Lands, also known as the ‘Paystreke Claim’ that spans Resurrection Creek valley just north or downstream of the project area. Bridge location and road construction are both dependent on whether or not there is an

agreement. This issue has been addressed through the design of alternatives. Effects to the various resources from the type of access in each alternative will be discussed by resource.

**Mining History:** The mining history of the area contributes to the sense of place of the Hope community. Hope residents have expressed concerns about losing the mining character through implementation of the project. Some are concerned about a potential decrease in tourism.

**Recreational Gold Panning Opportunities:** Recreational gold panning in the project area is a popular activity. Continuation of recreational gold panning in areas of the project that would be restored may impede restoration efforts. This is a significant issue that was addressed in the development of alternatives.

## Alternatives

In response to issues raised by the public six alternatives were developed including the No Action and Proposed Action alternatives. Alternative 1, No Action proposes no restoration activities to take place in the project area.

*Alternative 2*, the proposed action restores 0.9 miles of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions and enhance fish and riparian wildlife habitat on public lands. Restoration activities would also take place on the Haun Trust Lands for about 0.2 miles, as identified in a potential agreement. Two temporary bridges would be constructed. About 0.35 miles of new road construction would be required to relocate an existing section of the road to Palmer Creek out of the floodplain. Recreational gold panning would continue to be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold panning south (upstream) of the Haun Trust Lands on the project area. To interpret the mining history of the area interpretive panels would be located at the overlook area along the Resurrection Pass Trail.

*Alternative 3* would restore 0.9 miles of Resurrection Creek. This alternative includes a temporary bridge over the combined channel of Resurrection and Palmer Creeks. Approximately 0.7 miles of new road construction would occur around the east side of the Haun Trust Lands. An additional 0.35 miles of new road construction would occur to relocate Palmer Creek Road out of the floodplain. Recreational gold panning activities would continue within the project area. Interpretive signs would be installed to display information on the mining history of the area. A cooperative agreement could be developed with the Hope Historical Society to see if mining cabin and interpretive program could be created in Hope. The Resurrection Pass North Trailhead would be reconstructed.

*Alternative 4, the DEIS Preferred Alternative,* would reconstruct 0.9 miles of Resurrection Creek within the project area. Access to the project would be gained through National Forest lands and an existing easement across private lands. A temporary bridge would cross Resurrection Creek and access the Resurrection Pass National Recreation Trail. The Resurrection Pass National

Recreation Trail would be temporarily rerouted during construction to minimize conflicts with trail users and construction activities. Other temporary bridges would be constructed over the Resurrection Creek diversion channel and over Palmer Creek. Approximately 0.43 miles of road would need to be constructed. The Resurrection Pass Trail would be upgraded to a construction road for 0.33 miles. Interpretive programs are the same as Alternative 3.

*Alternative 5* would restore 0.4 miles of the uppermost portion of Resurrection Creek on public lands and 0.2 miles of stream on the Haun Trust Lands. Access including roads and bridges would be done by the same means as described under Alternative 2. Interpretive signs would be installed to display information on the mining history of the area. Interpretive programs are the same as Alternative 3.

*Alternative 6* would reconstruct a 0.5 mile portion of Resurrection Creek immediately upstream (south) of the Haun Trust. Access including roads, bridges and use of the Resurrection Pass Trail; would be done by the same means as described under Alternative 4. Interpretive signs would be installed to display information on the mining history of the area. Interpretive programs are the same as Alternative 3.

The public comment period for the DEIS was from April 9, 2004 to May 26, 2004. The Forest received eight letters from the public and other agencies. Chapters 2 and 3 of the Final Environmental Impact Statement have been updated to include additional information based on public comments.

## Environmental Consequences

## Physical Environment

### *Mineral Resources*

**Alternative 2** Restoration activities could potentially disturb the miners claim markers, excavations and mining equipment. The claim holder would benefit from the road improvement through Haun Trust Lands and the Palmer Creek Road relocation. Disruption of access to the mining claim would occur from restoration and road construction. This new road construction would provide better access to his claim. The claimant would indirectly benefit from the closure of recreational gold panning.

**Alternative 3** New road construction around the east side of the Haun Trust Lands may provide better access to the claim. Keeping recreational gold panning open in the project area, along with newly constructed roads would indirectly cause a negative effect on the claimant by encouraging traffic and the potential for vandalism on the mining claim.

**Alternatives 4, 5 & 6** Other effects are similar to those of Alt. 2 regarding claim markers, excavations and mining equipment, and relocation of Palmer Creek Road. Closure of recreational gold panning would have an indirect positive effect by decreasing the volume of traffic through the claim.

*Soil Resources*

**Alternative 2** About 9.01 acres of topsoil would be disturbed, causing a loss in soil productivity. About 1.42 acres of the disturbance will be permanent and irreversible.

**Alternative 3** About 10.77 acres of topsoil would be disturbed, causing a loss in soil productivity. About 3.18 acres of the disturbance will be permanent and irreversible.

**Alternative 4** About 9.69 acres of topsoil would be disturbed, causing a loss in soil productivity. About 3.18 acres of the disturbance will be permanent and irreversible.

**Alternative 5** About 4.52 acres of topsoil would be disturbed, causing a loss in soil productivity. About 1.42 acres of the disturbance will be permanent and irreversible.

**Alternative 6** About 7.06 acres of topsoil would be disturbed, causing a loss in soil productivity. About 2.6 acres of the disturbance will be permanent and irreversible.

*Aquatic and Hydrology Resources*

**Alternative 1** This alternative is not consistent with the Forest Service's goal to maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems, stream channel integrity, or promote the recovery of aquatic vegetation. Levels of heavy metals including mercury would remain at existing levels. Future mining within the watershed could further degrade riparian and habitat conditions.

**Alternative 2** This alternative would restore 1.1 miles of stream, providing a long-term benefit to channel function, aquatic and riparian habitat, and reductions in turbidity and flooding. Adverse effects to water quality would be primarily short-term and would occur during construction. Combined effects of stream sedimentation from both the proposed project and mining activities on Palmer and Resurrection Creeks are unlikely to exceed State Water Quality Standards except during diversion-related turbidity plumes. This alternative combined with past, present and future activities within the watershed are not expected to cause long-term detrimental impacts to aquatic resources or existing fisheries.

**Alternative 3** Alternative 3 includes 0.2 miles less channel restoration work than Alternative 2 and therefore has less up-front water quality disturbances. Recreational gold panning may reduce the cumulative long-term benefits of aquatic habitat rehabilitation and fish production is expected to be reduced by recreational gold panning.

**Alternative 4** Alternative 4 includes 0.2 miles less channel restoration work than Alternative 2. The cumulative effects to fisheries only incrementally differ between the two alternatives. Alternative 4 has less up-front water quality disturbances than Alternative 2, as well as less long-term benefits to channel function and aquatic habitat.

**Alternative 5** Alternative 5 includes 0.4 miles less channel restoration work than Alternative 2. Alternative 5 would generate less turbidity and therefore less short-term impacts to fish than Alternative 2. Alternative 5 would also provide roughly half of the long-term benefits to aquatic habitat and fisheries.

**Alternative 6** Alternative 6 includes 0.35 miles less channel restoration work than Alternative 4. Alternative 6 would contribute less up-front water quality disturbances than Alternative 4, as well as providing less long-term benefits to channel function and aquatic habitat.

*Ecological Resources*

**Alternative 1** The project area will remain in a disturbed condition from historic mining activity. The project area will not be returned to an ecologically functioning condition. Ecological pattern, process, and function will not return to a healthy state, as described in the desired future condition for vegetation in the Chugach Forest Plan.

**Alternatives 2, 3 & 4** Restoration activities will have the greatest impact in returning the project area and overall Resurrection Creek watershed to an ecologically functioning condition. Vegetation will be altered and removed within the project area during project activities. Restoration work will re-establish native vegetation in the riparian corridor where it is currently lacking. The appearance of the riparian forest will change. The structure and composition of the forested areas will be altered by removal of whole trees of different size class and species.

**Alternatives 5 & 6** Restoration activities will have some impact in returning the project area to an ecologically functioning condition. Effects will be similar to those of Alternatives 2-4, but in a smaller area. Restoration activities will not be as effective in restoring the greater watershed of Resurrection Creek as in the previous alternatives, but the effects will be the same.

*Wildlife*

**Alternative 1** Alternative 1 allows wildlife habitat to continue to degrade, does not offer educational opportunities, and continues to allow impacts from recreational gold panning and vehicles parking in the riparian area. Overall, this is the least beneficial alternative for wildlife.

**Alternative 2** Ultimately, none of the alternatives, including Alternative 1 will substantially impact threatened, endangered, proposed, or sensitive species, nor will they impact populations or viability of management indicator species, species of special interest, or any other wildlife species. In summary, indirect effects include improved habitat quality over time and direct effects include temporary disturbance of individuals and habitat for MIS, Species of Special Interest, and Migratory Birds.

**Alternative 3** Amount of restoration and effects are the same as Alternative 2. Alternative 3 allows potential impacts to habitat and disturbance to individual animals to continue with recreational gold panning.

**Alternative 4** Alternative 4 likely offers the most benefit and least impacts to wildlife and habitat of all alternatives

**Alternative 5** Restoration is less than all other action alternatives. This alternative provides the least long-term habitat improvement, but less short-term impacts than all action alternatives.

**Alternative 6** Restoration is greater than Alternative 5 and 1, but less than all other alternatives. This alternative provides less long-term habitat improvement, but less short-term impacts than all action alternatives except Alternative 5.

*Heritage*

**Alternative 1** Effects of this alternative to heritage resources and the community's sense of history will be minimal. Due to the relative stability of tailings piles in the project area it is expected that there will be little direct effects, either positive or negative, if they are left in place. However, some indirect negative effects may occur. These indirect negative effects may occur in the form of tailings being moved for recreational gold panning and relic hunting, both of which are difficult to patrol and monitor.

**Alternative 2** Restoration activities would cause a loss of 1.1 miles of tailings, as well as scattered surface and potential sub-surface artifacts. In addition, indirect of lost revenue for the community from a reduction in archaeo-tourism. The reduction of recreational gold panning in the project area may cause concentration of recreational miners to other areas, potentially increasing damage and looting of heritage resources located outside the project area. Interpretation would increase archaeo-tourism and showcase the community's history, educate the public on the value of heritage resources.

**Alternatives 3 & 4** Restoration activities would cause a loss of 0.9 miles of tailings, as well as scattered surface and potential sub-surface artifacts. Positive direct effects as a result of this alternative would be the same as Alternative 2. Direct negative effects as described for Alternative 2 would be slightly reduced.

**Alternative 5** Positive direct effects as a result of this alternative would be the same as alternatives 2, 3 and 4. Direct negative effects as a result of this alternative would be reduced in comparison to alternatives 2, 3 and 4 since this alternative would restore 0.6 miles of Resurrection Creek. This equates to a 0.6 mile loss of tailings, as well as scattered surface and potential sub-surface artifacts, which are a physical and visual history of Hope's mining past.

**Alternative 6** Effects resulting from this alternative would be very similar to those of alternative 5. The minor difference is the slightly larger proposed restoration area of 0.5 miles. Over all an increase of 0.1 mile of creek restoration will heighten negative effects only slightly.

*Recreation*

**Alternative 1** Resurrection Creek would remain open to recreational gold panning. No impacts would occur to recreationist using the Resurrection Pass National Recreation Trail or other users in the creek corridor.

**Alternative 2** Short-term indirect effects of traffic, dust, noise, smell, water clarity & safety result of heavy equipment operations. Approximately .48 miles of stream would be open to recreational gold panning, and 1.28 miles would be closed. Interpretation including displays, creating an interpretive historic mining cabin, and revising the gold panning brochure would be provided (same for other alternatives). Campers would no longer be able to drive to the rivers edge and set up camp. Resurrection Pass National Recreation Trail (RPNRT) would be permanently relocated within the new ROW.

**Alternative 3** Recreational gold panning will be allowed throughout the project area upon project completion. Approximately 3.15 miles of stream will be open to gold panning, which is an increase of 1.39 miles of water surface area from the existing condition. This may attract more recreational gold panning use to the area. Campers would no longer be able to drive or camp next to the rivers edge. The camping and parking area would be moved to the east side of Resurrection Creek Road. Resurrection Pass North Trailhead would be rebuilt. Trail users would benefit from an enlarged parking area.
**Alternative 4** Under alternative 4 approximately 0.48 miles of stream will be open to recreational gold panning and 1.28 miles will be closed. Indirect effects would be the same as under Alternative 2. Under Alternative 4 the RPNRT users would experience the greatest impact from the restoration project because trail users would be in the same corridor within the easement as the moving equipment in and out of the project area. However, the trail users would be separated from the equipment access area with a fence.

**Alternative 5** Under alternative 5 approximately 0.48 miles of stream would be open to gold panning and 1.28 miles will be closed. Effects would be the same as under Alternative 2. Dispersed camping would continue adjacent to the creek.

**Alternative 6** Under alternative 6 approximately 0.48 miles of stream will be open to gold panning and 1.28 miles will be closed. Effects would be the same as under Alternative 2. Dispersed camping would continue adjacent to the creek. Under Alternative 6 the direct and indirect effects to the RPNRT and users of the trail would be the same as Alternative 4.

*Social and Economic Resources*

**Alternative 1** There would be no changes from the current situation.

**Alternative 2** Implementation cost $900,000. About 3 job years would be created with a job related income of $67,000. Noise from road and trail construction would increase. Passenger vehicle traffic would increase for weekly trips. Opportunities for sport and commercial fishing may increase. An increase in Activities associated with various projects would be noticeable in the Hope area.

**Alternative 3** Implementation cost $914,000. About 3 job years would be created with a job related income of $69,000. Same effects would occur as Alternative 2.

**Alternative 4** Implementation cost $993,500. About 3 job years would be created with a job related income of $66,000. Same effects would occur as Alternative 2.

**Alternative 5** Implementation cost $484,500. About 1.7 job years would be created with a job related income of $38,000. Same effects would occur as Alternative 2.

**Alternative 6** Implementation cost $811,000. About 2.6 job years would be created with a job related income of $56,000. Same effects would occur as Alternative 2.

# CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

## Document Structure

The Chugach National Forest has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- *Index:* The index provides page numbers by document topic.
- *Map Packet:* The map packet contains a map of each alternative

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Seward Ranger District.

### Location

The analysis area is located in the Western Kenai Mountains ecological section at the northern end of the Kenai Peninsula on the Chugach National Forest. The stream flows northwardly into the Turnagain Arm of Cook Inlet. The town of Hope, Alaska lies adjacent to the mouth of the stream on Turnagain Arm. The project area begins at river mile 4.4 (upstream from tidewater) and extends upstream to river mile 5.8.

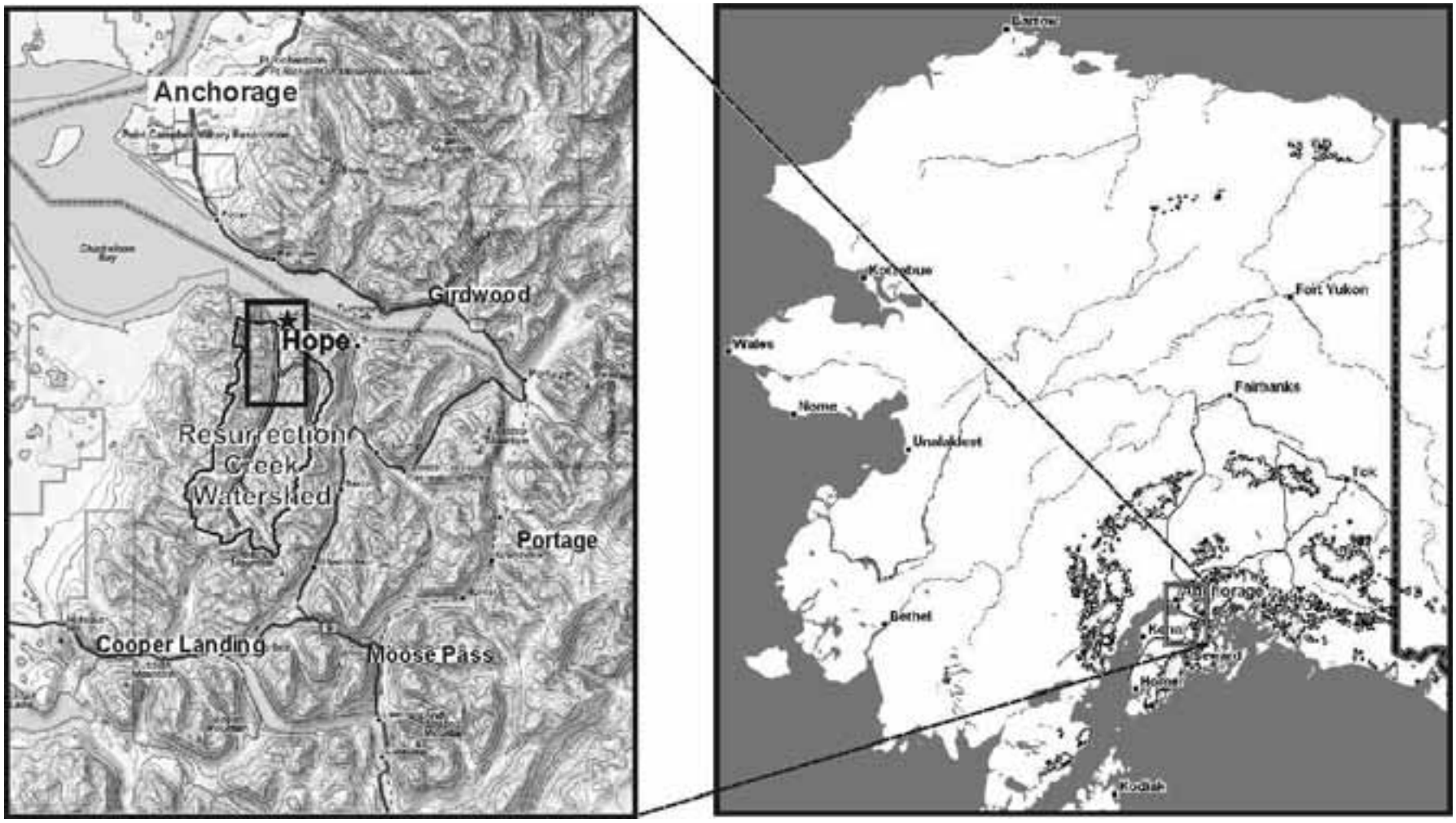



**Figure 2 Vicinity Map**

## Background

Resurrection Creek was home to Alaska's first gold rush just over a century ago. Stream placer deposits within the project area were mined using high-pressure water jets (hydraulic mining) during the first three decades of the 1900's. Through the proposed project reach, the valley bottom of Resurrection Creek varies from 300 to 500 feet wide. During mining, soil and vegetation were stripped from the valley bottom. The underlying alluvial sediments were pushed through sluice boxes using high power water jets. In the sluice boxes, gold flakes and nuggets were separated from the processed gravels.

In the mining process, valley bottom alluvial gravels (and cobbles and boulders) in the project area were worked down to an underlying clay layer, often 10 or more feet below the ground surface. The location of the river channel was likely moved several times during the hydraulic mining. The coarse alluvial sediments remaining after passing through sluices were pushed into numerous tailings piles along the valley bottom. During the mining process much of the soil, organics, and fine sediments within the mined valley bottom were washed down Resurrection Creek and eventually into Turnagain Arm.

Hydraulic and heavy equipment placer mining impacted much of the lower six miles of Resurrection Creek (Bair et al. 2002). Within the project reach most of the disturbance impacts relate to hydraulic mining. Tailings piles generated from hydraulic mining rise to as much as 25 feet high, and occupy the majority of the alluvial valley bottom within the project area. Tailings have disconnected or buried the historic complex of stream channels and wetlands that provided high quality habitat for salmon, bears, bald eagles, moose and other fish and wildlife species. Resurrection Creek flows have done little to alter the tailing piles over the last century. The mine tailings resulted in entrenchment of the stream and cutoff access from the historic floodplain. The direct impact of disturbance and loss of the stream's ability to access the floodplain have severely altered aquatic habitat and riparian vegetation composition. (Resurrection Creek Stream and Riparian Analysis, November 2002)

## Purpose and Need for Action

The purpose and need for action of the Resurrection Creek Stream and Riparian Restoration Project is to accelerate the recovery of riparian areas, and fish and wildlife habitat on a 0.9 mile segment of Resurrection Creek. Natural recovery from mining impacts has been minimal on this segment of Resurrection Creek. Historic placer mining operations have affected Resurrection Creek by straightening and simplifying the stream, and separating it from its floodplain. These impacts have degraded fish rearing and spawning habitat on Resurrection Creek, as well as adjacent wildlife riparian habitat for species such as bears and eagles. Natural recovery from mining impacts has been minimal on this segment of Resurrection Creek. The proposed project would greatly accelerate the recovery of riparian areas, and fish and wildlife habitat on Resurrection Creek. There is a need to examine a portion of the creek immediately downstream of the

project area on private land within the Haun Trust lands. Additional restoration activities may be implemented on the Haun Trust lands if the landowners have sufficient interest in implementing restoration measures. This action responds to the goals and objectives outlined in the Chugach National Forest Revised Land and Resource Management Plan, and helps move the project area towards desired conditions described in that plan. (Chugach LMP, May, 2002).

## Chugach Land and Management Plan Goals and Objectives relevant to the Resurrection Creek Stream and Riparian Restoration Project

### Soil Resources

*Goal:* Improve soil conditions where they have been degraded.

*Objectives*

- Where monitoring identifies areas of degraded soil conditions, apply site-specific restoration measures or recreational closures to improve the conditions.
- Accomplish watershed restoration activities where degraded watershed conditions exist.

### Water, Wetland and Riparian Areas

*Goal:* Provide for the proper functioning of streams, riparian areas, lakes, and wetlands.

*Objectives*

- Determine the current condition of aquatic ecosystems.
- Restore riparian habitat and near stream vegetation where it has been determined that the stream's proper functioning condition is outside the historic range of variability.

### Ecological Systems Management

*Goal:* Maintain a full range of naturally occurring ecological processes and flora native to South-central Alaska including a variety of vegetation types, patterns and structural components.

*Objectives*

- Develop a baseline estimate of current vegetation types, patterns and structural components on the Chugach National Forest. Monitor changes to these components to determine how well the plan is maintaining desired landscape conditions.

- Restore vegetation on landscapes affected by activities, natural events or processes to meet desired conditions.

### Management of Fish and Wildlife Habitat

*Goal:* Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

*Objectives*

- Implement standards and guidelines to protect species and their habitats through protection, conservation and restoration of important terrestrial and aquatic habitats.
- Create early to mid-successional habitat for moose and other early and mid-seral dependent wildlife species.
- Provide educational information for recreationists and others traveling in and through the Chugach National Forest on appropriate actions to avoid disruption to wildlife species.
- Improve fish habitat quality on streams, lakes and ponds at selected areas on the Chugach National Forest for sport, subsistence and personal uses.

### Heritage Resources

*Goal:* Protect heritage resources.

*Objectives*

- Implement management area direction for protection and data recovery from heritage resources.
- Work with the State Historic Preservation Officer and tribal governments to develop programmatic agreements addressing management activities common to the Chugach National Forest, including special use permits, small-scale mining, forest restoration activities, recreation and trail developments, and fish and wildlife habitat manipulation.
- Implement the programmatic agreement between the Forest Service and the State of Alaska Historic Preservation Officer.
- Work cooperatively with Native groups, local communities and the State Historic Preservation Officer to enhance historic and prehistoric values on the Forest.
- Prioritize heritage inventory and assessment to develop scientifically based predictive models for the Kenai Peninsula and other Forest geographic areas subject to active management or use.

### Recreation Resources

*Goal:* Provide recreation opportunities for interpretation and education as related to all Forest resources.

*Objective*

- Provide user education, resource interpretation; leave no trace principles, and visitor information through a variety of means both on and off the Forest.

## Revised Land and Resource Management Plan Desired Condition for Kenai Peninsula Geographic Area

### Fish and Wildlife

Anadromous fish runs of sockeye, pink, coho, and king salmon, along with Dolly Varden char and eulachon are abundant in the waters of the Kenai Peninsula. Resident populations of rainbow trout, lake trout and Dolly Varden char along with grayling and whitefish are sustained in the waters of the Chugach National Forest. Degraded fish habitat in Resurrection Creek will have restored productivity.

### Recreation and Tourism

Improvements such as bridges, trails, trailheads, expanded campgrounds, and new cabins will extend the ability of the Kenai Peninsula to accommodate increased summer recreation use without diminishing the area's natural quality.

### Resurrection Creek Landscape Assessment, January 2002

In order to respond to damaged resources and degraded land, and to enable future decision-making regarding the uses of the watershed and its resources, the Chugach National Forest (CNF) completed a landscape-level assessment. Landscape analysis for the Resurrection Creek watershed (Hart Crowser, 2002) was conducted and the results documented. The following proposed project is among several identified in the landscape analysis document.

Anadromous fish distribution has been identified up to river mile 19 of Resurrection Creek, with the lower 6 miles identified as critical habitat for spawning and rearing habitat for coho *Oncorhynchus kisutch*, chum *Oncorhynchus keta*, pink *Oncorhynchus gorbuscha* and chinook salmon *Oncorhynchus tshawytscha* (Crowser, RCLA, 2002). The project area lies within this critical habitat, between river miles 4.4 - 5.8. In addition, this area has been withdrawn from mineral entry and was identified as a potential pilot reach for restoration in the Landscape Analysis. The three main restoration and management components outlined in the 2002 Landscape Analysis document were: 1) aquatic habitat restoration, 2) vegetation restoration and management, 3) and heritage resources/human uses management.

**The Forest Service conducted an evaluation of the Resurrection Creek fisheries in 1990 – 1992.**

The study evaluated juvenile salmon distributions, smolt out-migrations, and inventoried stream habitat. The results of the study were compared to three other stream systems on the Kenai Peninsula: Hidden, Moose and Quartz Creek. The results showed that Resurrection Creek coho smolts were considerably smaller by age class (about 30%) than on the other streams. In addition, virtually all Resurrection Creek coho smolts were emigrating at age 1; however 90% of coho smolts on the other streams emigrated at age 2 and 3 (Blanchet and Wenger, 1993).

The lack of growth and early-age at which coho smolts emigrate from the watershed give a very strong indication that rearing within the system is severely limited. The tailings piles within the placer-mined reaches have disconnected the stream from the historic floodplains and side channel habitat. The side channels and alcoves within the now isolated or buried floodplains historically provided the flood flow refugia and over-wintering habitat which were critical to salmonids, especially coho.

## Proposed Action

The actions proposed by the Forest Service to meet the purpose and need include: (1) providing access for heavy equipment, which might include one or two temporary bridges or stream crossings over Resurrection Creek and/or Palmer Creek; (2) mechanical manipulation and grading of up to approximately 140,000 cubic yards of mine tailings to recover floodplain width and elevations; 3) excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat; (4) harvesting up to 5,000 trees, with and without root wads, for use on the new river channel and floodplain. Trees would be taken primarily from the project area. If constraints to harvest at the project area are high, additional off-site harvest from the Hope Highway Fuels Reduction Project area might be needed; (5) replacing soils and organics stripped away during historic placer mining operations. Soil enhancement would improve growing conditions for native plant communities in constructed floodplains and riparian areas. Soil and sod would likely be gathered from source areas both within and outside the project area; (6) thinning existing overstocked riparian sapling spruce and cottonwood stands adjacent to Resurrection Creek; and (7) re-vegetation of native plant species on constructed floodplains and riparian areas. Natural re-vegetation (without planting) would be used where seed sources and site conditions are favorable. Where such conditions are lacking, the site would be planted.

The proposed action intent is to restore stream and riparian/floodplain habitat to pre-mining conditions. Long-term objectives are to restore stand structure to 20% large trees (>16” in diameter), 15% small trees (12-16” in diameter), 20% poles (6-12” in diameter), 45% seedling/saplings (0-6” in diameter).

It is not the intention for the proposed management action to eliminate natural disturbance, but rather to restore a more natural disturbance regime. Rather than

an objective of stabilization of channel meandering and migration the proposed project would restore the area to a state of quasi-equilibrium in which a disturbance level of duration, timing, and magnitude are within pre-anthropogenic effects.

## Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and the environmental consequences in order to make the following decisions:

The Resurrection Creek Stream and Riparian Restoration Project Environmental Impact Statement will evaluate site-specific management proposals, consider alternatives, and analyze the effects of the activities proposed in these alternatives. It will form the basis for the Responsible Official to determine; (1) whether or not the proposed activities and alternatives are responsive to the issues, are consistent with Forest Plan direction, meet the purpose and need, and are consistent with other related laws and regulations directing National Forest Management Activities; (2) which actions, if any, to approve; (3) and, whether or not the information in the analysis is sufficient to implement proposed activities.

## Public Involvement

The Notice of Intent (NOI) was published in the Federal Register on October 17, 2003. The NOI asked for public comment on the proposal from October 17, 2003 to November 16, 2003. As part of the public involvement process, the agency held previous scoping efforts. The first effort was sent on February 5, 2003, and the second was submitted to the public on June 6, 2003. Since those notices were provided to the public, the Forest Service gathered more information regarding this proposal, and determined that the appropriate level of analysis for this proposal is an environmental impact statement (EIS). The third scoping effort was conducted on October 16, soliciting public comments on the proposed EIS.

Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues to address.

## Issues

The Forest Service separated the issues into two groups: significant and non-significant. 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 explain 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)…" A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the project record.

As for significant issues, the Forest Service identified the following issues during scoping:

### Access:

Access to the stream restoration portion of the project area is a significant issue for alternative development. Several items relating to access are dependent upon whether or not there would be an agreement providing access through the Hauns Trust Lands, also known as the 'Paystreke Claim' that spans Resurrection Creek valley just north or downstream of the project area. Bridge location and road construction are both dependent on whether or not there is an agreement. The types of bridges are also a component of the access issue. The stream restoration portion of the project area can be accessed by several different routes along Resurrection Creek. Each option requires 2 or 3 bridge crossings to construct the project or gain access to waste disposal areas. Access can be either through or around the Hauns Trust Lands. Access options will be a function of costs and opportunity based on the outcome of negotiations with the Paystreke claim owners. This issue has been addressed through the design of alternatives. Effects to the various resources from the type of access in each alternative will be discussed by resource.

### Mining History of the Hope Community

The mining history of the area contributes to the sense of place of the Hope community. Hope residents have expressed concerns about losing the mining character through implementation of the project. Some are concerned about a potential decrease in tourism.

**Indicator:** Miles of tailings destroyed as a result of project implementation.

### Recreational Gold Panning Opportunities

Recreational gold panning in the project area is a popular activity. Continuation of recreational gold panning in areas of the project that would be restored may impede restoration efforts. This is a significant issue that was addressed in the development of alternatives.

**Indicator:** Number of miles open and useable terrain for recreational gold panning in each alternative within the project area.

The public comment period for the DEIS was from April 9, 2004 to May 26, 2004. The Forest received eight letters from the public and other agencies. Chapters 2

and 3 of the Final Environmental Impact Statement have been updated to include additional information based on public comments.

## Permits, Licenses, and other Entitlements

Permits Needed for the Resurrection Creek Channel and Riparian Restoration Project

### Alaska Department of Natural Resources

*Office of Project Management and Permitting (OPMP):* This office oversees State and Federal permitting as pertains to the Alaska Coastal Management Program (ACMP). The Project Area lies within the "Coastal Zone" and project activities must be consistent with the intent of the ACMP. OPMP coordinates and compiles the State, Federal, and District (Kenai Peninsula Borough) permit reviews by various agencies. A Project Consistency Determination by OHMP generally requires that all relevant permits will be approved by the permitting agencies involved with the Project. When the Forest Service publishes the Draft EIS for the Resurrection Creek Stream Restoration Project, OHMP will distribute the document to other permitting agencies, and assist in arranging a pre-project meeting with interested agencies.

*Office of Habitat Management and Permitting (OHMP):* This office enforces Alaska Statute (AS) 41.114, Section 870 – "protecting freshwater anadromous fish habitat", and Section 840 – "providing free passage of anadromous and resident fish in fresh waterbodies". Under a Memorandum of Understanding between the ADNR and the Forest Service (98 MOU-10-011) OHMP will submit a letter of concurrence to the Forest Service if the proposed Forest Service project will be conducted in concurrence with Title 41 requirements. . The letter of concurrence may spell out the required conditions needed for the project to take place. OHMP can ask for assistance in review from the Alaska Department of Fish and Game.

*Division of Mining, Land, and Water:*

1. Water Use Permit. The Water Division oversees applications for water rights and temporary water use permits for use or diversion of the waters of the State of Alaska. Proposed diversions of Resurrection Creek will need to be reviewed by the Division of Water, and may require a temporary water use permit for stream water diversions occurring under the project.

2. Navigability: The State of Alaska claims ownership of the bed of all "navigable" water bodies on Federal Lands in Alaska. The Forest Service maintains ownership of bed of all "non-navigable" waterbodies situated on National Forest System Lands. The USBLM makes the official determination and ruling on whether a water body is considered "navigable". However, the ADNR frequently makes a determination of navigability previous to a final ruling by the BLM, particularly if it is in the State's interest. After review of the DEIS, ADNR, Division of Mining, Lands and Water determined that the portion of Resurrection

Creek located in Sections 21 and 28 of T. 9 N., R. 2 W., S. M., and the portion of Palmer Creek in Section 21 (including all of the project area) to be navigable according to the State's standards. Refer to the ADNR's letter of 3/16/2004 in Appendix A.

3. Temporary Land Use Permit: Since ADNR determined Resurrection and Palmer Creeks to be navigable, they therefore claim State title to the bed of the creek. Accordingly, ADNR's South-central Regional Office requests a temporary Land Use Permit for activities taking place on the bed of those creeks within the project area. The proposed Resurrection Creek Stream Restoration Project would actually increase the length of Resurrection Creek through the project area (by increasing stream sinuosity). If Resurrection Creek is also determined navigable by the USBLM, this would mean that implementation of the project would increase the area of the streambed, and cause a conversion of some National Forest System Lands to State Lands. The Forest Service takes the position that not until such time as the USBLM makes a final determination of navigability would there be clear title to the bed of these creeks by the State of Alaska.

**State Historic Preservation Office (SHPO):** Section 106 of the National Historic Preservation Act requires review of any project funded, licensed, permitted, or assisted by the federal government for impact on significant historic properties. The agencies must allow the State Historic Preservation Officer and the Advisory Council on Historic Preservation, a federal agency, to comment on a project. The Alaska Historic Preservation Act contains a provision similar to Section 106, which mandates that any project with state involvement be reviewed in a similar manner.

**U.S. Army Corps of Engineers, Regulatory Division (ACOE**): This project falls under the regulations of Section 404 of the Clean Water Act as concerns dredge and fill within wetlands. The project will need a Jurisdictional Determination by ACOE to determine if it qualifies under a Nationwide Permit (#27 – for restoration of fish and wildlife habitat) or will require an individual permit. In either case, project construction would need to follow ACOE practices for minimizing impacts to wetland areas. This Section 404 permitting process requires approval of a Section 401 (Water Quality) permit from the Alaska Department of Conservation. Both ADEC and the Corps will need to review proposed practices for the project to assure minimization of project impacts to water quality.

**Alaska Department of Environmental Conservation:** The ADEC enforces the water quality standards of the State of Alaska. ADEC must approve a Clean Water Act Section 401 permit to assure the project complies with State Water Quality Standards. The permit can place stipulations on techniques used during project construction. ADEC works with the ACOE to evaluate Section 401

compliance. USEPA can oversee the Section 401 Permitting if they see the necessity.

**Kenai Peninsula Borough:** ACMP consistency requires that the project meet the policies of the Kenai Peninsula Coastal Management Plan. During the project consistency review, the Borough reviews the proposed project to assure it meets Borough Policies. Lacking consistency, the Borough can ask for modifications to the plan. In their 5/13/04 letter to ADNR-OPMP, the Borough voices "no objection to the proposed project" based on the mitigation measures proposed for construction in the project DEIS (see Appendix A).

**U.S. Fish and Wildlife Service, Ecological Services:** Since Resurrection Creek is an anadromous stream, USF&WS is involved in the ACMP Permitting Process and can submit comments and recommendations to OPMP during project review.

**National Marine Fisheries Service:** Since Resurrection Creek is an anadromous stream, NMFS is involved in the ACMP Permitting Process and can submit comments and recommendations to OPMP during project review. In relation to essential fish habitat (EFH), Brian Lance of the NMFS has written the Forest Service (7/7/04) and stated that:

> *"The NMFS has reviewed the biological assessment and EFH determination for the Resurrection Creek Rehabilitation project. The described action will have no more than a minimal impact and will not result in any substantive adverse effect to EFH. No further EFH Assessment is required and NMFS does not offer any EFH Conservation Recommendations. Further EFH consultation is not necessary. NMFS has no objection to the project."*

Figure 3 Resurrection Creek

# CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

## Introduction

This chapter describes and compares the alternatives considered for the Resurrection Creek Stream and Riparian Restoration Project. It includes a description of each alternative considered. 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. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., length of stream to be restored, and the associated amount of material to be mechanically manipulated) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the area available for recreational gold panning).

## Alternatives Considered in Detail

The Forest Service developed six alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public.

### Alternative 1

#### *No Action*

Under the No Action alternative, current management would continue to guide management of the project area. Under this alternative, no restoration activities would take place in the project area. Other existing and planned activities will continue, such as reconstruction of Resurrection Pass Trail. Current fish and wildlife habitat conditions within the project area induced by historic mining activities could conceivably persist for centuries. Mine tailings generated 60 to 100 years ago, are essentially functioning as dikes confining all flood flows to a single channel. The confinement of the stream channel has severely impacted both fish and wildlife habitat. Although the disturbance occurred up to a century ago, riparian vegetation and wildlife habitat have not recovered to a pre-mining condition.

### Restoration Activities Common to all Action Alternatives

Harvesting up to 5,000 trees, with and without root wads, for use as bank and floodplain stabilization on the new river channel and floodplain would occur within and outside of the project area. Within the project area, approximately 50% of medium to large spruce and cottonwood would be retained. Additional trees may come from the Hope Highway Fuels Reduction Project area.

The proposed revegetation would create a mosaic of vegetation of different species and ages. Soils and organics stripped away during historic placer mining operations would be replaced to enhance revegetation efforts. Soil enhancement would improve growing conditions for native plant communities in constructed floodplains and riparian areas. Soil and sod would likely be gathered from source areas both within and outside the project area. Some thinning of existing overstocked riparian sapling spruce and cottonwood stands adjacent to Resurrection Creek may occur. Constructed floodplains and riparian areas would be planted with native species. Natural re-vegetation (without planting) would occur where seed sources and site conditions are favorable. Where such conditions are lacking, the site would be planted.

All action alternatives would greatly accelerate the recovery of riparian areas, and fish and wildlife habitat on Resurrection Creek in the areas proposed for restoration.

## Alternative 2

### *The Proposed Action*

This alternative would restore 1.1 miles of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions and enhance fish and riparian wildlife habitat on public and private lands.

Staging of the restoration construction would start at the confluence of Resurrection and Palmer Creeks. The flow of Palmer Creek would be diverted into the Resurrection Creek Channel 0.3 miles upstream of the existing confluence. Resurrection Creek would then be diverted into the historic western channel. The Palmer Creek fan would be manipulated to restore multiple stream channels.

Mechanical manipulation and grading of up to 139,380 cubic yards of mine tailings to recover floodplain width and elevations would take place. Tracked excavators and bulldozers would be used to manipulate tailings to reconstruct stream channels, gravel bars, wetlands and floodplains. Excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat would be necessary to restore Resurrection Creek. Substrate within the mine tailings would be graded and contoured to increase average bankfull width to flood prone width ratios from 1:1 to 7:1 to allow flood flows access to the historic floodplain and off channel fish habitat. Channel thalweg slope would be decreased from 1.5% to 1.1% and sinuosity from 1.01 to 1.3 by increasing channel length by approximately 200 yards. Side channels, wetland complexes and off channel rearing ponds would be designed and constructed to maintain 5-20% of the perennial flow. Recently constructed off channel rearing ponds and side channels would be modified and or incorporated into the network.

Restoration activities would also take place on 0.2 miles of Resurrection Creek on the Haun Trust Lands, as identified in the agreement. This may include

establishment of flood control, and construction of a fish-rearing channel on the east side of Resurrection Creek.

Work would begin at the up-stream end of the project area and proceed down the channel. The majority (>90%) of channel excavation, meanders, side channels, and ponds, woody structure placement and gravel bar construction would be conducted out of flowing water. After new channel segments are completed, the heavy equipment would be used to construct “push-up” dams composed of native substrate to divert water into the newly constructed channels.

Implementation of this alternative would be accomplished over two construction seasons. Restoration activities would cost approximately $590,000.

### Access

Access to the project would be gained through the Hauns Trust Lands under an agreement. The proposed action includes providing access for heavy equipment, including a temporary modular or log stringer bridge to be built over Resurrection Creek (illustrated as Upper Bridge on Alternative 2 Map), and another temporary bridge over Palmer Creek. The bridges may require a temporary crib constructed from timber, and tailing waste. Refer to the Alternative 2 map for bridge locations. The Palmer Creek bridge would cost approximately $13,000, and the upper bridge cost is approximately $58,000. Total bridge associated cost would be approximately $71,000.

### Road Construction

About 0.35 miles of new road construction would be required to relocate an existing section of the road to Palmer Creek out of the floodplain. Costs would be approximately $47,000.

### Recreational Gold Panning

Recreational gold panning would continue to be allowed north (downstream) of the Haun Trust Lands. By definition, use of a suction dredge 4-inch diameter or less, is considered recreation mining. A closure order would be issued restricting recreational gold panning south (upstream) of the Haun Trust Lands on the project area. Regulatory signs placed at the Resurrection Pass North Trailhead and at the dispersed camping/recreational gold panning area or at the newly created parking area. The Forest Service 1997 Gold Panning Brochure would be updated. Cost for the new signs would be approximately $2,000, and a new brochure would be about $2,000.

### Interpretation

To interpret the mining history of the area interpretive panels would be located at the overlook area along the Resurrection Pass Trail as shown on the map. Up to 6 panels interpreting the rehabilitation project, historic mining, fish and wildlife

would be displayed. Two other interpretive areas would be located north of the overlook along the trail. One would be adjacent to the big meadow. Refer to the Alternative 2 map for interpretation location. A kiosk interpreting the mining history and where recreation mining is allowed would also be placed at the new recreation parking area on the tailings waste site. Development of the interpretation would cost approximately $100,000.

A mining cabin and interpretive program would be developed at the new parking area. This may include moving a historic mining cabin to the new parking area and creating a mining exhibit including interpretation, period tools, and possibly an interpreter who would demonstrate mining techniques. Approximate costs of the mining exhibit are $65,000.

### Dispersed Camping

Barrier rocks or other impediments would be added to the dispersed camping area to block vehicles from parking and driving adjacent to the river. Campers would be able to park in the additional recreation parking area and camp either along the river or at the parking area.

**Cost of implementation of this alternative would be approximately $900,000.**

## Alternative 3

Alternative 3 would restore 0.9 miles of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions and enhance fish and riparian wildlife habitat. The flow of Resurrection Creek would be diverted out of its existing channel and into an excavated diversion channel starting at about river mile 5.8. The diversion channel would extend southeastward until it joins the existing Palmer Creek Channel. The flow would be maintained in the eastern channel of Resurrection Creek downstream of the current Palmer Creek confluence for the construction phase. The Palmer Creek fan would be manipulated to restore multiple stream channels.

Mechanical manipulation and grading of up to 128,640 cubic yards of mine tailings to recover floodplain width and elevations would take place. Excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat would be necessary to restore Resurrection Creek. Implementation of this alternative would be accomplished during two construction seasons. Restoration activities would cost approximately $585,000.

### Access

This alternative includes a temporary bridge over the combined channel of Resurrection and Palmer Creeks and the Palmer Creek bridge. The bridges would cost approximately $71,000.

### Road Construction

Alternative 3 would provide access for heavy equipment through National Forest lands by constructing approximately 1.02 miles of new road. Approximately 0.7 miles of new road construction would occur around the east side of the Haun Trust Lands. An additional 0.35 miles of new road construction would occur to relocate Palmer Creek Road out of the floodplain. Road costs are approximately $137,000.

### Recreational Gold Panning

Recreational gold panning activities would continue within the project area.

### Interpretation

Interpretive signs would be installed to display information on the mining history of the area. The signs would be located at an interpretive overlook located on the Resurrection Pass Trail as shown on the map. Up to 6 panels interpreting the rehabilitation project, historic mining, fish and wildlife would be displayed. A kiosk interpreting the mining history and where recreation mining is allowed will also be placed at the new recreation parking area on the tailings waste site. Cost of interpretation would be approximately $50,000.

A cooperative agreement could be developed with the Hope Historical Society to see if a mining cabin and interpretive program could be created in Hope. Estimated cost of the mining exhibit would be $65,000; it is possible that the funding could be split with the Hope Historical Society.

### Dispersed Camping

The existing dispersed camping area would be relocated to a new dispersed camping site built from tailings waste on the east side of the Resurrection Creek Road opposite the dispersed camping area, immediately northeast of the restroom. The new dispersed camping area would provide four or five camping sites and vehicle parking. Fines from screening the tailings or crushed aggregate would be used as the surface. Low-level developed tent pads would be created to accommodate campers. Vehicle barriers including wheel stops and boulders would be used to direct traffic. The area would be revegetated to provide an aesthetically pleasing camping experience. Barrier rocks or other impediments will be added to the dispersed camping area to restrict vehicles and camping adjacent to the river. All boulders found during project implementation will be

stockpiled for use as barriers in the dispersed camping area along Resurrection creek. Approximate costs would be $15,000.

### Resurrection Pass North Trailhead

The Resurrection Pass North Trailhead would be reconstructed. The reconstruction would include expanding the existing parking area by flattening and possibly removing some of the tailing piles at the south end of the parking lot for about 200 feet. Upon completion the total parking area would be approximately 500' by 100'. Fines from screened tailings or crushed aggregate would be used for the surface of the enlarged parking area. The district would eventually replace dilapidated signs, wheel stops and parking barriers and new ones added. An approximate cost of reconstruction would be $3,200.

Cost of implementation of this alternative would be approximately $914,000.

## Alternative 4 (DEIS Preferred Alternative)

This alternative would reconstruct 0.9 miles of Resurrection Creek within the project area. Staging of the restoration construction would start at the confluence of Resurrection and Palmer Creeks. The flow of Palmer Creek would be diverted into the Resurrection Creek Channel 0.3 miles upstream of the existing confluence. Resurrection Creek would then be diverted into the historic western channel. The Palmer Creek fan would be manipulated to restore multiple stream channels. Mechanical manipulation and grading of up to 128,640 cubic yards of mine tailings to recover floodplain width and elevations would take place. Excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat would be necessary to restore Resurrection Creek. Implementation of this alternative would be accomplished over two construction seasons. Restoration activities cost would be approximately $553,500.

### Access

Access to the project would be gained through National Forest lands and an existing easement across private lands. Under this alternative, a temporary bridge would cross Resurrection Creek and access the Resurrection Pass National Recreation Trail. Minor trail brushing to a width of approximately 10 feet, and grading would occur. The Resurrection Pass National Recreation Trail would be temporarily rerouted during construction to minimize conflicts with trail users and vehicles, and to increase safety of trail users and construction workers as shown on the Alternative 4 map. Another temporary bridge would be constructed over the Resurrection Creek diversion channel just upstream from the Haun Trust Lands. A third temporary bridge or crossing would be built over Palmer Creek. Bridge associated costs would be about $129,000.

### Road Construction

Approximately 0.06 miles of road would need to be constructed from the west terminus of the temporary bridge to reach the existing Resurrection Pass National Recreation Trail. The Resurrection Pass Trail would be upgraded to a construction road for 0.33 miles. An additional section of approximately 100 feet of new temporary road construction would be needed to access the valley bottom from the Resurrection Pass Trail. The Palmer Creek Road would be relocated out of the floodplain. This would require 0.35 miles of new road construction. Road construction costs would be approximately $62,000.

In order to access the restoration area, multiple equipment crossings would take place across Resurrection Creek. The crossings could include a fiord, or small log culvert and limited clearing of vegetation. Up to four round-trip equipment crossings may occur. The Resurrection Pass National Recreation Trail would be used for initial access. Costs would be approximately $2,000 for the construction information & safety signs.

### Recreational Gold Panning

Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold panning south (upstream) of the Haun Trust Lands on the project area. Regulatory signs would be placed at the Resurrection Pass North Trailhead and at the dispersed camping/recreational gold panning area or at the newly created parking area. The Forest Service 1997 Gold Panning Brochure would be revised and reprinted. Costs would be approximately $2,000.

### Interpretation

Interpretive signs would be installed to display information on the mining history of the area. The signs would be located at an interpretive overlook located on the Resurrection Pass Trail. Up to 6 panels interpreting the rehabilitation project, historic mining, fish and wildlife would be displayed. Two other interpretive areas would be located north of the overlook along the trail. One would be adjacent to the big meadow. Refer to the Alternative 4 map for interpretation location. A kiosk interpreting the mining history and where recreation mining is allowed would also be placed at the new recreation parking area on the tailings waste site. Development of the interpretation would cost approximately $100,000.

A cooperative agreement could be developed with the Hope Historical Society to see if a mining cabin and interpretive program could be created in Hope. Estimated cost of the mining exhibit would $65,000; it is possible that a portion of the funding could come from the Hope Historical Society.

### Dispersed Camping

Barrier rocks or other impediments will be added to the dispersed camping area to block vehicles from parking and driving adjacent to the river. Campers will be

able to park in the additional recreation parking area and camp either along the river or at the parking area.

Vehicular access of the existing dispersed camping area would be relocated to a new parking area on the east side of the Resurrection Creek Road opposite from the dispersed camping area, immediately northeast of the restroom. Fines from screening the tailings or crushed aggregate would be used as the surface. Vehicle barriers including wheel stops and boulders would be used to direct traffic. Barrier rocks or other impediments will be added to the dispersed camping area to prohibit vehicles and camping adjacent to the river. All boulders found during project implementation will be stockpiled for use as barriers in the dispersed camping area along Resurrection creek. Costs would be approximately $15,300.

### Resurrection Pass National Recreation Trail

Prior to restoration activities, the Resurrection Pass National Recreation Trail would be rerouted to provide a safe route for trail users while heavy equipment is used to restore the project.

The reroute of the Resurrection Pass National Recreation Trail would be restored after construction activities were complete. A one time initial mobility of construction equipment would occur on the Resurrection Pass Trail. An approximate cost for the trail reroute would be $63,000.

Cost of implementation of this alternative would be approximately $993,500.

## Alternative 5

This alternative would restore 0.6 miles of the uppermost portion of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions, to enhance fish and riparian wildlife habitat located on public lands and 0.2 miles of stream on the Haun Trust Lands.

Staging of restoration construction would start at the confluence of Resurrection and Palmer Creeks. The flow of Resurrection Creek would not be diverted. The Palmer Creek fan would be manipulated to restore multiple stream channels. Mechanical manipulation and grading of up to 49,500 cubic yards of mine tailings to recover floodplain width and elevations would take place. Excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat would be necessary to restore Resurrection Creek in the Palmer Creek fan area.

Restoration activities would also take place on the Hauns Trust Lands, as identified in the agreement. This may include flood plain restoration of that portion of the stream to improve flood prone areas, and establishment of a fish-rearing channel. Implementation of this alternative would be accomplished during a single construction season. Restoration activities would cost approximately $298,000.

### Access

Access to the project would be gained through the Hauns Trust Lands under an agreement. Actions include providing access for heavy equipment, which would include a temporary log stringer bridge to be built over Palmer Creek. The bridge may require a temporary crib constructed from timber, and tailing waste. Refer to the Alternative 5 map for bridge location. The bridge would cost approximately $13,000.

### Road Construction

Approximately 0.35 miles of road would be constructed to relocate the existing section of Palmer Creek road out of the floodplain. An approximate cost of road construction would be $ 47,000.

### Recreational Gold Panning

Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold panning south (upstream) of the Haun Trust Lands on the project area. Regulatory signs would be placed at the Resurrection Pass North Trailhead and at the dispersed camping/recreational gold panning area or at the newly created parking area. The Forest Service 1997 Gold Panning Brochure would be revised and reprinted. Costs would be approximately $2,000.

### Interpretation

Interpretive signs would be installed to display information on the mining history of the area. The signs would be located at an interpretive overlook located on the Resurrection Pass Trail. Up to 6 panels interpreting the rehabilitation project, historic mining, fish and wildlife would be displayed. A kiosk interpreting the mining history and where recreation mining is allowed would also be placed at the dispersed recreation area. Cost of interpretation would be approximately $50,000.

A cooperative agreement could be developed with the Hope Historical Society to see if a mining cabin and interpretive program could be created in Hope. Estimated cost of the mining exhibit would be $65,000; it is possible that the funding could be split with the Hope Historical Society.

### Dispersed Camping

Dispersed camping would continue at the existing location.

Cost of implementation of this alternative would be approximately $484,500.

## Alternative 6

Reconstruction of a 0.5 mile portion of Resurrection Creek immediately upstream (south) of the Haun Trust Lands would be done in Alternative 6. Staging of the restoration construction would start below the confluence of Resurrection and Palmer Creeks. The flow of Resurrection Creek would be diverted into the historic western channel. Restoration activities would take place on the lower portion of Resurrection Creek.

Mechanical manipulation and grading of up to 89,900 cubic yards of mine tailings to recover floodplain width and elevations would take place. Excavation of a meandering river channel and adjacent side channels, including the development of a channel with instream pools and spawning habitat would be necessary to restore Resurrection Creek. Implementation of this alternative would be accomplished during a single construction season. Restoration activities would cost approximately $424,500.

### Access

Access to the project would be gained through National Forest lands and an existing easement across private lands. Under this alternative, a temporary bridge would cross Resurrection Creek and access the Resurrection Pass National Recreation Trail where it is used as a road. Refer to the Alternative 6 map. Minor trail brushing to a width of approximately 10 feet, and grading would occur on the Resurrection Pass National Recreation Trail where it would be used as a road. The Resurrection Pass National Recreation Trail would be temporarily rerouted during construction to minimize conflicts with trail users and construction equipment, and to increase safety of trail users and construction workers. Another temporary access bridge would be constructed over the Resurrection Creek diversion channel just upstream from the Haun Trust Lands on the lower end of the project. A temporary bridge or crossing would be built over Palmer Creek. The bridges would cost approximately $116,000.

In order to access the restoration area, multiple equipment crossings would take place across Resurrection Creek. The crossings could include a ford, or small log culvert and limited clearing of vegetation. Up to four round-trip equipment crossings may occur. The Resurrection Pass National Recreation Trail would be used for initial access.

### Road Construction

Approximately 0.06 miles of road would need to be constructed from the west terminus of the temporary bridge to reach the existing Resurrection Pass National Recreation Trail. The Resurrection Pass Trail would be upgraded to a construction road for 0.33 miles. A section of approximately 100 feet of new temporary road construction would be needed to access the valley bottom from the Resurrection Pass Trail. Refer to the Alternative 6 Map. Approximately 0.35 miles of road would be constructed to relocate the existing section of Palmer

Creek road out of the floodplain. An approximate cost of road construction would be $62,000.

### Recreational Gold Panning

Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold panning south (upstream) of the Hauns Trust Lands on the project area. Regulatory signs would be placed at the Resurrection Pass North Trailhead and at the dispersed camping/recreational gold panning area or at the newly created parking area. The Forest Service 1997 Gold Panning Brochure would be revised and reprinted. Costs are approximately $2,000.

### Interpretation

Interpretive signs would be installed to display information on the mining history of the area. The signs would be located at an interpretive overlook located on the Resurrection Pass Trail. Up to 6 panels interpreting the rehabilitation project, historic mining, fish and wildlife would be displayed. Another interpretive area would be constructed along the trail south of the overlook. A kiosk interpreting the mining history and where recreation mining is allowed will also be placed at the dispersed recreation area. Cost of interpretation would be approximately $75,000.

A cooperative agreement could be developed with the Hope Historical Society to see if a mining cabin and interpretive program could be created in Hope. Estimated cost of the mining exhibit would be $65,000; it is possible that the funding could be split with the Hope Historical Society.

### Dispersed Camping

Dispersed camping would continue at the existing location.

### Resurrection Pass National Recreation Trail

Prior to restoration activities, the Resurrection Pass National Recreation Trail would be temporarily rerouted to provide a safe route for trail users while heavy equipment is used to restore the project.

The reroute of the Resurrection Pass National Recreation Trail would be restored after construction activities are complete. A one time initial mobility of construction equipment would occur on the Resurrection Pass Trail. An approximate cost for the trail reroute would be $63,000.

Cost of implementation of this alternative would be approximately $811,000.

## Table 1 Alternative Comparison Table

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| **Component** | | | | | | |
| **Amount of Restoration** | None | Restore 1.1 miles of Resurrection Creek on Forest and Hauns Trust Lands. | Restore 0.9 miles of Resurrection Creek | Restore 0.9 miles of Resurrection Creek | Restore 0.6 miles of the uppermost portion of Resurrection Creek and through the Hauns Trust Lands. | Restore 0.5 mile portion of Resurrection Creek immediately upstream (south) of the Haun Trust Lands |
| **Access** | As is | Access through the Hauns Trust Lands under an agreement | Access through National Forest lands | Access through National Forest lands and an existing easement across private lands. | Access through the Hauns Trust Lands under an agreement | Access through National Forest lands and an existing easement across private lands. |
| **Bridges-Temporary modular or log stringer bridges** | No Bridges | Palmer Creek bridge *Cost $13,000*<br><br>Upper Resurrection Creek Bridge *Cost $58,000* | Palmer Creek bridge *Cost $13,000*<br><br>Upper bridge crossing over the combined channel of Resurrection and Palmer Creeks. *Cost $ 58,000* | Palmer Creek bridge *Cost $13,000*<br><br>Lower Resurrection Creek bridge accessing the Resurrection Pass National Recreation Trail. *Cost 58,000*<br><br>Bridge over Resurrection Creek Diversion Channel *Cost $58,000* | Palmer Creek bridge *Cost $13,000* | Lower Resurrection Creek bridge accessing the Resurrection Pass National Recreation Trail. *Cost 58,000*<br><br>Bridge over Resurrection Creek Diversion Channel *Cost $58,000* |
| **Road Construction & Reconstruction** | No road construction | Construct approximately 0.35 miles of new road for Palmer Creek Road | Construct approximately 0.35 miles of new road for Palmer Creek Road | Construct approximately 0.35 miles of new road for Palmer Creek Road | Construct approximately 0.35 miles of new road for Palmer Creek Road | Construct approximately 0.35 miles of new road for Palmer Creek Road |

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| **Component** | | | | | | |
| | | relocation<br>*Cost $47,000* | relocation<br>*Cost $47,000*<br><br>Construct approximately 0.7 miles of new road around the Haun Trust Lands<br>*Cost $ 90,000* | relocation<br>*Cost $47,000*<br><br>*Construct approximately 0.06 miles of road to existing trail<br><br>*Construct approximately .33 miles of new temporary road on existing trail<br><br>*Construct 100 feet of new temporary road<br>**Cost of the above 3 items $15,000* | relocation<br>*Cost $47,000* | relocation<br>*Cost $47,000*<br><br>*Construct approximately 0.06 miles of road to existing trail<br><br>*Construct approximately .33 miles of new temporary road on existing trail<br><br>*Construct 100 feet of new temporary road<br>**Cost of the above 3 items $15,000* |
| **Equipment Crossings** | None | Excavator crossings to place bridge | Excavator crossings to place bridge | Excavator crossings to place bridge | Excavator crossings to place bridge | Excavator crossings to place bridge |
| **Mechanical Manipulation and grading of tailings** | None | 139,380 cubic yards Restoration of stream channel on Haun Trust Lands | 128,640 cubic yards | 128,640 cubic yards | 49,500 cubic yards Restoration of stream channel on Haun Trust Lands | 89,900 cubic yards |
| **Restoration Costs** | | *$590,000* | *$585,000* | *$553,500* | *$298,000* | *$424,500* |
| **Recreational Gold Panning** | Area is open to recreational gold panning. | Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold | Recreational gold panning activities would continue. | Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold | Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold | Recreational gold panning would be allowed north (downstream) of the Haun Trust Lands. A closure order would be issued restricting recreational gold |

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| **Component** | | | | | | |
| | | panning south (upstream) in the project area.<br><br>The Gold Panning Brochure and would be updated regulatory signs.<br>*Cost $2,000* | | panning south (upstream) in the project area.<br><br>The Gold Panning Brochure would be updated. regulatory signs *Cost $2,000* | panning south (upstream) in the project area.<br><br>The Gold Panning Brochure would be updated.<br>*Cost $2,000* | panning south (upstream) in the project area.<br><br>The Gold Panning Brochure would be updated. regulatory signs *Cost $2,000* |
| **Interpretation Panels at the Overlook Location of Kiosk** | None | Interpretive panels at the overlook and kiosk at new recreation parking area. Refer to the map for the two other locations.<br>*Cost $100,000*<br><br>Development of a mining cabin and interpretive program in the south-west corner of the new parking area.<br>*Cost $65,000* | Interpretive panels at the overlook, kiosk at Resurrection Pass North Trailhead *Cost $50,000*<br><br>A cooperative agreement could be developed with Hope Historical Society to develop a mining and interpretive program could be created in Hope. *Cost $65,000-could be split* | Interpretive panels at the overlook and kiosk at new recreation parking area. Refer to the map for the two other locations.<br>*Cost $100,000*<br><br>A cooperative agreement could be developed with Hope Historical Society to develop a mining and interpretive program could be created in Hope. *Cost $65,000-could be split* | Interpretive panels at the overlook, Kiosk at existing dispersed recreation parking area.<br>*Cost $50,000*<br><br>A cooperative agreement could be developed with Hope Historical Society to develop a mining and interpretive program could be created in Hope. *Cost $65,000-could be split* | Interpretive panels at the overlook, Kiosk at existing dispersed recreation parking area. Refer to the map for the other location.<br>*Cost $75,000*<br><br>A cooperative agreement could be developed with Hope Historical Society to develop a mining and interpretive program could be created in Hope. *Cost $65,000-could be split* |
| **Dispersed Camping** | | Dispersed camping continues, Relocate vehicles to new parking area built from excess tailings. *Cost $15,000* | Relocate dispersed camping and vehicles to new parking area built from excess tailings.<br>*Cost $15,000* | Dispersed camping continues, Relocate vehicles to new parking area built from excess tailings. *Cost $15,000* | Dispersed camping and vehicle access continues at the existing location | Dispersed camping and vehicle access would continue at the existing location. |

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| **Component** | | | | | | |
| **Resurrection Pass National Recreation Trail** | | | No changes would occur to the Resurrection Pass National Recreation Trail. | Reroute and restore a 0.4 mile segment of Resurrection Pass National Recreation Trail<br>*Cost $63,000*<br><br>A one time initial mobility of construction equipment would occur on the Resurrection Pass Trail. | | Reroute and restore a 0.4 mile segment of Resurrection Pass National Recreation Trail<br>*Cost $63,,000*<br><br>A one time initial mobility of construction equipment would occur on the Resurrection Pass Trail. |
| **Resurrection Pass North Trailhead** | | The Resurrection Pass North Trailhead would remain in its current condition. | The Resurrection Pass North Trailhead would be reconstructed.<br>*Cost $3,000* | The Resurrection Pass North Trailhead would remain in its current condition. | The Resurrection Pass North Trailhead would remain in its current condition. | The Resurrection Pass North Trailhead would remain in its current condition. |
| **Preliminary Cost of Implementation** | *$0* | *$900,000* | *$914,000* | *$993,500* | *$484,500* | *$811,000* |

## Mitigation Common to All Alternatives

The Forest Service also developed the following mitigation measures to be used as part of all of the action alternatives.

| Resource | Mitigation |
|---|---|
| **Hydrology**<br>*Bridges* | Best management practices (FSH 2509.22, Soil and Water Conservation Handbook) would be used to minimize sediment input into the creek during construction of bridge abutments, bridge piers, and decking of the bridge. BMPs would also be used to avoid stream sedimentation during removal of these temporary bridges. Bridges would be clear span structures with abutments sufficiently offset from the ordinary high water line to preclude armoring the bank to protect the structure. The bridge crossing site on Resurrection is constrained by coarse placer tailings. In-water work areas for bridge construction and removal would be isolated from flowing waters of Resurrection and Palmer Creeks with silt curtains or similar techniques to control sedimentation. Bridges and/or culverts installed would be large enough to provide for the free passage and spawning activities of anadromous fish, and would be positioned to minimize changes in the direction or velocity of stream flow. |
| *Roads and Trails* | Road reconstruction and the relocation/reroute of the Resurrection Pass Trail would be designed and constructed using BMPs. Of primary importance would be limiting the concentration of runoff waters on the road and trail surfaces. Gravels from existing tailings piles in the project area could be used for road overlay and improved drainage. Establishing adequate water conveyance under the road for the multiple small side slope cross drainages, as well and facilitating drainage surface runoff off the road would be necessary. |
| *Channel work and diversions* | Channel and floodplain excavation and grading would be done “in the dry”. Where excavation and grading work takes place immediately adjacent to Resurrection or Palmer Creeks, a construction berm or silt fence would be used to keep construction related sediment runoff out of the creek. Stream diversions and their associated turbidity plumes would be limited to a minimum number. All stream diversions would occur during ADNR’s instream construction timing window, between May 15 and July 15 to minimize impacts to spawning or rearing salmon. |
| *Stream Crossings* | Stream crossings by equipment would be minimized in number and location, and would be situated at stream sites that would be restored as part of the larger project. Stream crossings would be made from bank to bank, perpendicular to the direction of stream flow. |

| Resource | Mitigation |
|---|---|
| *Fuel Storage* | Any fuel storage facility for petroleum and petroleum products would be located a minimum 100 feet from anadromous waters and would meet ADEC standards. |
| *Bank Stabilization and Work Areas* | All bank cuts, fills, and exposed earthwork adjacent to a wetlands or water bodies would be stabilized to prevent erosion and sedimentation that might occur during or after construction. Work areas for road/parking construction, tailings sorting, timber harvesting, and soil and tailings removal and placement would be isolated from Resurrection and Palmer Creeks with silt fences or similar devices to prevent sedimentation of the surface waters. |
| *Effectiveness Monitoring* | Effectiveness of mitigation techniques would be reviewed at the end of each construction season with ADNR-OHMP and improvements, if applicable, incorporated into plans for the next season. |
| *Mercury* | Mitigation measures to be employed to avoid adverse effects from mercury during channel construction include:<br>Prohibit excavation down to false bedrock (a clay layer within the valley bottom) where elemental mercury beads are most likely to reside. |
| | Keep a mercury cleanup kit on site in order to remove any concentrations of elemental mercury discovered during construction. Assure that Forest Service personnel are on the ground during all excavation work, and that those persons are trained in both recognition of elemental mercury, and cleanup techniques. Both a Forest Service contracting officer and archeologist(s) would be on site during construction. |
| | Wherever possible reconstruct channel segments “in the dry.” |
| | Sediment surges from connection of constructed channel segments to Resurrection Creek would occur during the period from May 15 - July 15 when water levels are high on Resurrection and Palmer Creeks, and dilution factors are greatest. |
| | Water and fine sediments within previously constructed side channels in the project area were sampled in 2004 and showed low mercury levels. During construction, additional sampling of fine-grained sediments would occur to assure that anomalously high mercury concentrations are not present. All mercury sample data would be made available to interested agencies and parties. |
| *Navigability and Potential State -* | Rerouting of Resurrection Palmer Creeks and construction of engineered debris jams would be accomplished in a manner that would not diminish the navigability of these streams or impair or impede the |

| Resource | Mitigation |
|---|---|
| *Ownership of the River Bed* | ability of the public to navigate the water bodies. Materials taken from below ordinary high-water mark of Resurrection and Palmer Creeks would be kept to a minimum and would be replaced below the ordinary high-water mark. |
| *Tailings Waste/Parking Area* | BMPs would be used for design and construction of the new parking area, particularly as relates to surface drainage. Tailings would be retained within the project area. Mostly tailings would be recontoured on site. Up to 20,000 CY could be used for parking area construction, and up to 20,000 CY could be wasted onto the private lands within the project area. |
| **Minerals** | Protection of all known mineral improvements by specifications in construction contracts is required. |
| | Provide the claim holder with reasonable access routes in order to carry out necessary mineral associated activities. |
| **Ecology** | All mechanized equipment will be cleaned and free of all foreign plant materials and soil prior to being moved into the project area. |
| | Only native species will be used to replant and revegetate the project area. |
| | Any fill material that is brought on site should be known to be free of noxious weed, non-native species, or exotic plant species seeds or materials. |
| **Fisheries** | The use of mechanized equipment within the ordinary high-water mark would be held to a minimum. Approved equipment would be limited to loaders, tracked excavators and dozers with GVW no greater than 120,000 lbs., portable winch, power saws and hand tools. Heavy equipment will be cleaned and free of leaks before use in the stream channel. BMP VM-2 |
| | A spill containment plan would be prepared and approved before operations would start. The plan would require absorbent booms and diapers to be available on-site in case of petroleum leaks or spills. Refuel equipment will be stored at a site at least 100 feet from water bodies. BMP W-4. |
| | Control methods such as diversion of water away from excavation sites, use of filter fences, temporary settling ponds, and check dams would be required in order to minimize downstream sedimentation and turbidity. BMP R-13. |

| Resource | Mitigation |
|---|---|
| | Erosion control methods such as coarse mulch, willow cuttings and native grass would be applied to areas of exposed or disturbed ground in order to reduce surface soil erosion and sedimentation. BMP VM-3. |
| | Access roads would be rehabilitated upon completion of the project. These roads would be water-barred and seeded with native grasses in order to prevent noxious weed infestation. The dispersed sites along these access roads would be rehabilitated to block vehicular access to the river's channel. BMP R-7, R-23. |
| | Access points used to allow heavy machinery to enter streams will be rehabilitated and protected following use. This will include shaping the disturbed area to a stable configuration, revegetation, and applying rock or woody debris where necessary to further protect the site from subsequent erosion, and to block vehicular access to the stream. The objective of this is to limit erosion and sediment delivery from disturbed areas immediately adjacent to the stream. |
| | In stream work would be limited to the time period designated on the Hydraulic Permit by the State. In stream work is proposed for and would be limited to mid-May through mid-July. |
| | Fish stranded in dewatered sections will be rescued and transported above the project area. |
| | Site-specific areas such as islands above the 50-year floodplain would be mulched or have blue joint sod mats applied. Overstocked sapling stands of spruce and cottonwood growing in areas of adequate soils would be thinned. Thinned material would be used as coarse mulch throughout the new floodplain. Natural vegetation of mechanically disturbed areas will be promoted where seed source and site conditions are favorable. Native plant species originating from local genetic stocks would be planted in areas where natural re-vegetation conditions are not favorable |
| **Heritage** | If heritage resources are found during construction, then construction would cease until a plan is made on how to deal with the specific relic. |
| **Recreation/ Scenery** | Appropriate signing or other cautionary measures will be implemented in conjunction with all management activities to notify the public of restoration activities. Implementation of these measures will be the responsibility of the person initiating the action (e.g., equipment contractor, logging contractor, etc.) |
| | Notify the National Recreation Reservation Service 8 months prior to project initiation. This will enable the service to notify recreationists |

| **Resource** | **Mitigation** | |
|---|---|---|
| | who rent any of the nine public use cabins on the Resurrection Pass trail of the restoration activities. | |
| | No equipment associated with the restoration project will be staged at the trailhead or dispersed camping area. | |
| | On Saturdays and Sundays, no heavy equipment operations would occur within ¼ mile of the Resurrection Pass National Recreation Trail. | |
| | **Mitigation** | **Design Feature** (method to accomplish mitigation) |
| **Wildlife** | Maintain/develop a balance of different vegetation types, age classes, and habitat components (increase large trees, snags, downed logs). Retain largest old cottonwoods for bald eagle nesting habitat. | Retain 50% of current spruce and cottonwood 15”-24.9” dbh.<br>Retain all cottonwood > 25” dbh.<br>Retain 15+ snags/acre (largest available, preferably hardwoods). Retain 120+ pieces of downed wood/ acre (largest available)<br>Snags/acre estimated as a midpoint between minimum forest plan guidelines and numbers found in the reference reach which is higher than normal due to the spruce bark beetle. Logs/acre between minimums in forest plan, and those found in the reference reach, based on recommendations from Brian Bair for restoration needs. |
| | Maintain or increase early successional hardwood habitat for moose and lynx. | Patch cuts to encourage natural birch regeneration from seed sources. Develop moose ponds at sod source sites. |
| | Maintain existing wildlife habitat if new nests or important habitat areas are located during project implementation. | Follow forest plan guidelines |
| | Reduce potential bear/human interactions after project completion | Develop screened foraging habitat for bears along the creek from the Resurrection Pass Trail. |

### Mitigation Specific to Alternatives 2 and 5

| Resource | Mitigation |
|---|---|
| **Recreation** | Under Alternatives 2 and 5 the permanent reroute of the Resurrection Pass National Recreation Trail (RPNRT) would have to be completed prior to rerouting the river channel into the trail. |

### Mitigation Specific to Alternative 3

| Resource | Mitigation |
|---|---|
| **Hydrology** | BMPs would be used in design and construction of the proposed Resurrection Pass North Trailhead parking area extension, including grading the parking area to drain away from Resurrection Creek. |
| **Recreation** | Under Alternative 3, RPNRT will be shown as an improvement on contract project map and will be protected during operations. |
| | Alternative 3, temporary prohibition of recreational gold panning will occur in the sections south of the Haun Trust Lands during restoration activities. Panning can resume upon project completion. |

### Mitigation Specific to Alternatives 4 and 6

| Resource | Mitigation |
|---|---|
| | The temporary reroute of the RPNRT would have to occur prior to placing restoration equipment on the trail to allow trail users a safe passage around construction activities. |
| | Under Alternative 4 and 6, the new road construction needed to connect the RPNRT to the project area at the lower bridge location and the south end of the Haun Trust Lands would be recontoured, rehabbed and planted upon project completion. |

## Monitoring Common to All Alternatives

| Resource | Monitoring Measure |
|---|---|
| **Ecology** | Monitoring for introduction of new populations or increases of known existing non-native species populations will help in determining if project activities are affecting these populations. |
| **Heritage** | A heritage resource person will be on site to monitor construction activities on a daily basis. |
| **Recreation** | Potential conflicts between contractor and recreational trail users will be evaluated periodically throughout the project to assure user safety. If conflicts occur between trail users and restoration efforts, specific operating hours may be established for the contractor. |

# Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of the need to restore Resurrection Creek and the associated riparian, aquatic and wildlife habitats, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore an alternative was considered, but dismissed from detailed consideration for reasons summarized below.

### Alternative 7

Reconstruction of the floodplain on 1.1 mile portion of Resurrection Creek within the project area would be done in Alternative 7. Harvesting up to 1,000 beetle killed trees, with and without root wads, for use in floodplain stabilization would occur within and outside of the project area.

Resurrection Creek would not be diverted under this alternative and its channel would remain in its present location. The Palmer Creek fan would be manipulated to restore multiple stream channels. Tailings piles would be pulled

back from both Resurrection and Palmer Creeks and floodplain would be leveled out adjacent to both creeks. Mechanical manipulation and grading of up to 98,200 cubic meters of mine tailings to recover floodplain width and elevations would take place. Cost of floodplain restoration would approximately $711,000

### Access

Access to the project would be gained through National Forest lands and an existing easement across private lands. Under this alternative, a bridge would cross Resurrection Creek to provide access to the Resurrection Pass National Recreation Trail. The alternative includes providing access for heavy equipment, which would include a permanent bridge to be built over Resurrection Creek just downstream from the private lands, a temporary bridge over Resurrection Creek upstream from the private lands, and a temporary bridge over Palmer Creek. The permanent bridge would use concrete or steel abutments, and the temporary bridges could require a crib constructed from timber, and tailing waste. Cost of the bridges would be approximately $332,000 ($275,000 for permanent bridge, Upper bridge $44,000, and Palmer Creek Bridge $13,000).

Minor trail brushing to a width of approximately 10 feet, and grading would occur on the segment of the Resurrection Pass National Recreation Trail used as a road. The hiking trail would be temporarily rerouted during construction to minimize conflicts with trail users and vehicles, and to increase safety of trail users and construction workers.

### Road Construction

Approximately 0.06 miles of new road would need to be constructed from the west terminus of the permanent bridge to reach the existing Resurrection Pass National Recreation Trail. About 0.33 miles of the Resurrection Pass National Recreation Trail would need to be re-graded and brushed to accommodate construction traffic. An additional section of approximately 100 feet of new temporary road construction would be needed to access the project area. The Palmer Creek Road would be relocated out of the floodplain. This would require 0.35 miles of new road construction. Road construction costs would be approximately $59,000.

This alternative was removed from further analysis for the following reasons. Mechanical manipulation limited to pulling back and grading the tailings does not meet the purpose and need to restore Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions, and enhance fish and riparian wildlife habitat. This alternative would have little positive effects on channel length, slope or sinuosity in the short and long-term. Side channel habitat or spawning habitat for fish would not be increased. Salvage of beetle killed trees and retention of green trees would not provide enough woody material for reinforcement of the reconstructed stream channel. Construction of a new permanent bridge is not necessary for future use due to the existing trail bridge, and would be economically unfeasible.

# Comparison of Effects by Alternative

This section provides a summary of the effects of implementing each alternative. Information is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

## Physical Environment

### *Mineral Resources*

**Alternative 1** The claimant on the southern boundary would continue to use the existing road through the Hauns Trust Lands and the section of the Palmer Creek access road that frequently floods. The claimant would also be indirectly affected by the continued vandalism caused by some recreational gold panners who access Resurrection Creek via the existing road.

**Alternatives 2 & 6** Restoration activities could potentially disturb the miners claim markers, excavations and mining equipment. The claim holder would benefit from the road improvement through Hauns Trust Lands and the Palmer Creek Road relocation.
Disruption of access to the mining claim would occur from restoration and road construction. This new road construction would provide better access to his claim.
The claimant would indirectly benefit from the closure of recreational gold panning.

**Alternative 3** New road construction around the east side of the Haun Trust Lands may provide better access to the claim.

Keeping recreational gold panning open in the project area, along with newly constructed roads would indirectly cause a negative effect on the claimant by encouraging traffic and the potential for vandalism on the mining claim.

**Alternatives 4 & 5** Other effects are similar to those of Alt. 2 regarding claim markers, excavations and mining equipment, and relocation of Palmer Creek Road.

Closure of recreational gold panning would have an indirect positive effect by decreasing the volume of traffic through the claim.

### *Soil Resources*

**Alternative 1** No effects to soil disturbance or soil productivity would occur. Soil productivity will continue to increase at varying rates. Recreational gold panners will continue to mine small amounts of soil. The extraction sites are small and usually don't have significant erosion.

**Alternative 2** Loss in soil productivity would result for areas of road construction, and restoration. About 9 acres of topsoil would be disturbed. About 1.42 acres of the disturbance would be permanent and irreversible. The remainder would be revegetated to meet the desired future revegetation conditions.

**Alternative 3** Loss in soil productivity would result for areas of road construction, trail construction and restoration. About 10.8 acres of topsoil would be disturbed. About 3.2 acres of

the disturbance will be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

**Alternative 4** Loss in soil productivity would result for areas of road construction, trail construction and restoration. About 9.7 acres of topsoil would be disturbed. About 2.7 acres of the disturbance would be permanent and irreversible. The remainder will be revegetated to meet the desire future revegetation conditions.

**Alternative 5** Loss in soil productivity would result for areas of road construction, trail construction and restoration. About 5 acres of topsoil would be disturbed. About 1.4 acres of the disturbance would be permanent and irreversible. The remainder will be revegetated to meet the desire future revegetation conditions.

**Alternative 6** Loss in soil productivity would result for areas of road construction, trail construction and restoration. About 7 acres of topsoil would be disturbed. About 2.6 acres of the disturbance would be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

## Biological Environment

### *Aquatic and Hydrology Resources*

**Alternative 1** This alternative is not consistent with the Forest Service's goal to maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems, stream channel integrity, or promote the recovery of aquatic vegetation. Levels of heavy metals including mercury would remain at existing levels. Future mining within the watershed could further degrade riparian and habitat conditions.

**Alternative 2** This alternative would restore 1.1 miles of stream, providing a long-term benefit to channel function, aquatic and riparian habitat, and reductions in turbidity and flooding. Adverse effects to water quality would be primarily short-term and would occur during construction. Currently there are few projects or activities occurring within the Resurrection Creek Watershed that would cumulatively impact the water or aquatic resources. Commercial and recreation mining on Resurrection Creek are small scale and limited. State mining regulations limit the amount of mining related sediments that may enter the creek. Combined effects of stream sedimentation from both the proposed project and mining activities on Palmer and Resurrection Creeks are unlikely to exceed State Water Quality Standards except during diversion-related turbidity plumes. This alternative combined with past, present and future activities within the watershed would not be expected to cause long-term detrimental impacts to aquatic resources or existing fisheries.

**Alternative 3** Alternative 3 includes 0.2 miles less channel restoration work than Alternative 2 and therefore has less up-front water quality disturbances. Recreational gold panning would likely reduce the cumulative long-term benefits of aquatic habitat rehabilitation and fish production.

**Alternative 4** Alternative 4 includes 0.2 miles less channel restoration work than Alternative 2. The cumulative effects to fisheries only incrementally differ between the two alternatives. Alternative 4 has less up-front water quality disturbances than Alternative 2, as well as less long-term benefit to channel function and aquatic habitat.

**Alternative 5** Alternative 5 includes 0.5 miles less channel restoration work than Alternative 2. Alternative 5 would generate less turbidity and therefore less short-term impacts to fish than Alternative 2. Alternative 5 would also provide roughly half of the long-term benefits to aquatic habitat and fisheries.

**Alternative 6** Alternative 6 includes 0.4 miles less channel restoration work than Alternative 4. Alternative 6 would contribute less up-front water quality disturbances than Alternative 4, as well as providing less long-term benefits to channel function and aquatic habitat.

### *Ecological Resources*

**Alternative 1** The project area would remain in a disturbed condition from historic mining activity. The project area would not be returned to an ecologically functioning condition. Ecological pattern, process, and function would not return to a healthy state, as described in the desired future condition for vegetation in the Chugach Forest Plan.

**Alternatives 2, 3 & 4** Restoration activities would have the greatest impact in returning the project area and overall Resurrection Creek watershed to an ecologically functioning condition. Vegetation would be altered and removed within the project area during project activities. Restoration work will re-establish native vegetation in the riparian corridor where it is currently lacking. The appearance of the riparian forest would change. The structure and composition of the forested areas would be altered by removal of whole trees of different size class and species.

**Alternatives 5 & 6** Restoration activities would have some impact in returning the project area to an ecologically functioning condition. Effects will be similar to those of Alternatives 2-4, but in a smaller area. Restoration activities would not be as effective in restoring the greater watershed of Resurrection Creek as in the previous alternatives, but the effects would be the same.

### *Wildlife*

**Alternative 1** Alternative 1 allows wildlife habitat to continue to degrade, does not offer educational opportunities, and continues to allow impacts from recreational gold panning and vehicles parking in the riparian area. Overall, this is the least beneficial alternative for wildlife.

**Alternative 2** Ultimately, none of the alternatives, including Alternative 1 would substantially impact threatened, endangered, proposed, or sensitive species, nor would they impact populations or viability of management indicator species, species of special interest, or any other wildlife species. In summary, indirect effects include improved habitat quality over time and direct effects include temporary disturbance of individuals and habitat for MIS, Species of Special Interest, and Migratory Birds.

**Alternative 3** Amount of restoration and effects would be the same as Alternative 2. Alternative 3 allows potential impacts to habitat and disturbance to individual animals to continue with recreational gold panning.

**Alternative 4** Alternative 4 likely offers the most benefit and least impacts to wildlife and habitat of all alternatives

**Alternative 5** Restoration is less than all other action alternatives. This alternative provides the least long-term habitat improvement, but less short-term impacts than all action alternatives.

**Alternative 6** Restoration would be greater than Alternative 5 and 1, but less than all other alternatives. This alternative provides less long-term habitat improvement, but less short-term impacts than all action alternatives except Alternative 5.

## Social Environment

### *Heritage*

**Alternative 1** Effects of this alternative to heritage resources and the community's sense of history would be minimal. Due to the relative stability of tailings piles in the project area it is expected that there would be little direct effects, either positive or negative, if they were left in place. However, some indirect negative effects may occur. These indirect negative effects may occur in the form of tailings being moved for recreational gold panning and relic hunting, both of which are difficult to patrol and monitor.

**Alternative 2** Restoration activities would cause a loss of 1.1 miles of tailings, as well as scattered surface and potential sub-surface artifacts. In addition, indirect of lost revenue for the community from a reduction in archaeo-tourism. The reduction of recreational gold panning in the project area may cause a concentration of recreational miners to other areas, potentially increasing damage and looting of heritage resources located outside the project area. Interpretation would increase archaeo-tourism and showcase the community's history, and educate the public on the value of heritage resources.

**Alternatives 3 & 4** Restoration activities would cause a loss of 0.9 miles of tailings, as well as scattered surface and potential sub-surface artifacts. The other effects described for Alternative 2 are the same for Alternatives 3 and 4.

**Alternative 5** Positive direct effects as a result of this alternative would be the same as Alternatives 2, 3 and 4. Direct negative effects as a result of this alternative would be reduced in comparison to Alternatives 2, 3 and 4; since this alternative would restore 0.6 miles of Resurrection Creek. This equates to a 0.6 mile loss of tailings, as well as scattered surface and potential sub-surface artifacts, which are a physical and visual history of Hope's mining past.

**Alternative 6** Effects resulting from this alternative would be very similar to those of Alternative 5. The minor difference is the slightly lower proposed restoration area of 0.5 miles.

### *Recreation*

**Alternative 1** Resurrection Creek would remain open to recreational gold panning. No impacts would occur to recreationists using the Resurrection Pass National Recreation Trail or other users in the creek corridor.

**Alternative 2** Short-term indirect effects of traffic, dust, noise, smell, water clarity & safety result from heavy equipment operations. Approximately 0.48 miles of stream would be open to recreational gold panning, and 1.28 miles would be closed. Educational opportunities would be provided with interpretive displays, creating an interpretive historic mining cabin, and revising the gold panning brochure. Campers would no longer be able to drive to the rivers edge and set up camp.

**Alternative 3** Recreational gold panning would be allowed throughout the project area upon project completion. Approximately 3.15 miles of stream would be open to gold panning, which is an increase of 1.39 miles of water surface area from the existing condition. This may attract more recreational gold panning use to the area. Campers would no longer be able to drive or camp next to the rivers edge. The camping and parking area would be moved to the east side of Resurrection Creek Road. Resurrection Pass North Trailhead would be rebuilt. Trail users would benefit from an enlarged parking area.

**Alternative 4** Under Alternative 4 approximately 0.48 miles of stream would be open to recreational gold panning and 1.28 miles would be closed. Indirect effects would be the same as under Alternative 2. Under Alternative 4 the RPNRT users would experience the greatest impact from the restoration project because trail users would be in the same corridor within the easement as the moving equipment in and out of the project area. However, the trail users would be separated from the equipment access area with a fence.

**Alternative 5** Under Alternative 5 approximately 0.48 miles of stream would be open to gold panning and 1.28 miles would be closed. Effects would be the same as under Alternative 2. Dispersed camping would continue adjacent to the creek.

**Alternative 6** Under alternative 6 approximately .048 miles of stream would be open to gold panning and 1.28 miles would be closed. Effects would be the same as under Alternative 2. Dispersed camping would continue adjacent to the creek. Under Alternative 6 the direct and indirect effects to the RPNRT and users of the trail would be the same as Alternative 4.

### *Social and Economic Resources*

**Alternative 1** There would be no changes from the current situation.

**Alternative 2** Implementation cost $900,000. About 3 job years would be created with a job related income of $67,000. Noise from road and trail construction would increase. Passenger vehicle traffic would increase for weekly trips. Opportunities for sport and commercial fishing may increase. An increase in activities associated with various projects would be noticeable in the Hope area.

**Alternative 3** Implementation cost $914,000. About 3 job years would be created with a job related income of $69,000. Same effects would occur as Alternative 2.

**Alternative 4** Implementation cost $993,500. About 3 job years would be created with a job related income of $66,000. Same effects would occur as Alternative 2.

**Alternative 5** Implementation cost $484,500. About 2 job years would be created with a job related income of $38,000. Same effects would occur as Alternative 2.

**Alternative 6** Implementation cost $811,000. About 2.6 job years would be created with a job related income of $56,000. Same effects would occur as Alternative 2.

# CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This Chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

## Physical Environment

### Minerals

#### *Affected Environment*

#### CHARACTERIZATION OF THE WATERSHED

#### Geology

From its headwaters, Resurrection Creek flows northward through a broad valley 21 miles long, floored with a thick deposit of gravels. It enters Turnagain Arm at the town of Hope. Throughout the greater part of its length the stream has incised a deep canyon-like channel. Near the lower end of the valley, the stream flood plain widens and a short distance below the mouth of Palmer Creek, it has a width of 500 feet. High bench gravels flank the flood plain along both sides.

Bedrock in this drainage is slate and greywacke of the Upper Cretaceous Valdez Group (Nelson, 1994). Stream and bench gravels consist of sandstone, slate, minor conglomerate, granite and a little clayey matrix. Boulders are common up to three feet wide and locally are much larger. Graywacke boulders predominate, while granite and conglomerate boulders are much less abundant. The average thickness of the productive gold-bearing gravels which rest on a bluish-yellow clay “bedrock,” is seven feet. The gravel below the clay has been found to be non-productive (Tuck, 1933). Production grades of 0.01 ounces per cubic yard have been reported, although higher grades occur locally (Jansons and others, 1984).

#### Mining History

Placer gold mining operations on Resurrection Creek began in 1888. Extensive hydraulic and hand placer mining began in 1895 and continued intermittently into the 1950s (Jansons and others, 1984). There was an unsuccessful attempt to use a hydraulic elevator on Resurrection Creek which failed due to lack of water and presence of large boulders (Moffit, 1906). The productive portion of Resurrection Creek is from its junction with Palmer Creek to Turnagain Arm.

The town of Hope was established in 1895 during the gold rush to the Turnagain Arm field. In 1896 about 3,000 people came into the Turnagain Arm area. It was estimated that 2,000 to 2,500 people came to the Adjacent Sunrise District. Following the initial gold rush around the turn of the century and the initial surge of gold production, mining activity and production decreased quickly. This was due to the fact that the deposits which could be easily worked profitably by hand methods were exhausted and also due to the small size of higher grade deposits which were usually confined to the channels of the present day stream courses. Substantial amounts of lower grade stream placer and low-grade glacial deposits remained but these required the development of hydraulic mining systems and considerable capital investment. By 1908 there were approximately 50 people working on claims in the area. In 1931, only 20 people worked mines in the Moose Pass and Hope Mining Districts. The adjacent town of Sunrise had dwindled to a population of 2 people by 1930. During the 1930s, 60 to 70 people lived between Hope and Moose Pass and in the summer an additional 25 miners came into the area. Mining that took place after 1942 is not well known since written documentation is lacking, but mining regulations were published which required operators to submit plans in order to mine on Forest Service managed lands.

The U.S. Bureau of Mines estimated total placer gold production from Resurrection Creek and including the mouth of Palmer Creek, since 1895 to be 30,000 to 40,000 ounces (Jansons and others, 1984). They estimated that approximately 2,000 to 3,000 ounces have been produced since 1980.

## REGULATORY CONSTRAINTS INFLUENCING MANAGEMENT OF THE PROJECT AREA

The Organic Administration Act requires the Forest Service, as the land manager, to minimize environmental impacts without materially interfering with a mining claimant’s rights under the General Mining Laws. Since mining is a legitimate use of the National Forest, the Forest Service is mandated to integrate the development and use of minerals with the use of other resources to the extent possible under the laws governing minerals disposal.

The 1872 Mining Law, as amended, confers a statutory right upon a mining claimant to enter upon public lands to prospect, develop and mine valuable minerals. Forest Service projects implemented in the Resurrection Creek watershed, must not materially interfere with bona fide mining activities, or “uses reasonably incident thereto.” Both BLM and the Forest Service have the same management authority under the Surface Resources Act. This case is highly relevant to the Forest Service’s authority to manage and improve fisheries habitat in the Resurrection Creek drainage, where unpatented federal mining claims exist.

By location and entry, in compliance with the 1872 Mining Law, a claimant acquires certain rights against other citizens and against the United States.

A valid mining claim creates a possessory interest in the land, which may be bartered, sold, mortgaged, or transferred by law, in whole or in part, as any other real property. A locator acquires rights against other possible locators when the locator has complied with the applicable Federal and State laws.

The claimant has the right to dispose of all locatable minerals on which the claimant has valid claims. Rights to common variety mineral materials depend upon the status of the claim on July 23, 1955 and on subsequent actions taken under 30 U.S.C. 613. Pre-1955 claims may have “surface rights.” This means that the claimant would have exclusive possession of the surface of the mining claim. There are no mining claims in the Resurrection Creek drainage with “surface rights.”

The Forest Service must respect claims and claimants’ property by taking precautions to avoid damage to claim corner markers, excavations, and other mining improvements and equipment. The claimant has a number of other rights including: reasonable access to the claim; the right to use the surface for prospecting, mining, and processing (but not exclusive possession); the use of timber as necessary for the mining operation; and the right to clear timber as necessary for mining (claimant cannot sell the timber).

### Mining Plans of Operation

Claimants must exercise certain rights acquired under the 1872 Mining Law under an approved plan of operations. On National Forest lands, such plans are approved by the Forest Service. Any minerals operations that may cause surface disturbance require at least, a notice of intent. Operations that may cause significant surface disturbance require an approved plan of operations. Requirements for a notice of intent and plan of operations are found in 36 CFR 228 Subpart A, Locatable Minerals regulations.

## DESCRIPTION OF CURRENT CONDITIONS

### Unpatented Mining Claims

There is one unpatented mining claim adjacent to the project area. The claimant has submitted a plan of operation, for review by the Forest Service. Mining activities will be conducted near the creek and would involve re-working areas that have previously been mined and mining some areas of virgin gravel.

### Acquired Land, Withdrawn From Mineral Entry

This area consists of 282.37 acres and is situated along Resurrection Creek, from the Resurrection Pass Trail footbridge to nearly 2,000 feet above Palmer Creek. The State of Alaska donated this land (also known as the Old St. Louis Claims) to the Forest Service by deed dated April 13, 1971. No mining claims may be located within the acquired lands area, so locatable minerals issues do

not apply here. However, there are three components to this property that command additional information: 1) acquired land is leasable; 2) within this area is a patented claim (private land); and (3) “recreational gold panning” is allowed within the active stream channel.

### Leasable Minerals with Acquired Status

The Mineral Leasing Act for Acquired Lands (Act of August 7, 1947) is the leasing authority for acquired federally owned deposits of coal, phosphate, sodium, potassium, oil, oil shale, gas, and sulphur. The 1970 Geothermal Steam Act added geothermal resources to the list of leasable resources. The 1947 and 1970 acts apply to 11 other categories of land and/or minerals, including “acquired lands transferred to the Department of Agriculture by other agencies for administration by the Forest Service”.

A prospecting application has been filed for approximately 108 acres of this land. BLM is reviewing the application, and if approved, the Forest Service would have the option of concurring with the decision.

### Patented Mining Claims

Within the acquired land area is a patented claim (private land) consisting of 18.54 acres. This property is referred to as the Hauns Trust Lands. A patented mining claim is one in which the Federal Government has passed its title to the claimant, giving the claimant title to the locatable minerals and, in most cases, the surface and all resources. The requirements for patenting a mining claim are given in detail in Title 43, Code of Federal Regulation, Part 3860. In 1994, the Interior and Related Agencies Appropriation Act authorized a moratorium on spending appropriated funds for the acceptance of new mineral patent applications, or processing of mineral patent applications that have not yet received the First Half of the Mineral Entry Final Certificate. The moratorium became effective on October 1, 1994 and has been renewed annually.

### Gold Panning

Recreational gold panning is a leisure-time activity allowed on lands withdrawn from mineral entry. This activity is allowed on the acquired land in the project area, and is discussed in more detail in the “Recreation” section of this chapter. Most of this area along the stream channel has been previously disturbed. However, gold panning, including suction dredging is occurring without adequate oversight to prevent environmental degradation. Additional damage to the stream is currently occurring from “recreational” miners who violate rules by digging in the stream banks and undermining trees and other vegetation. Suction dredging (intake of 4 inches or less) is allowed in the active stream channel, but only between May 15 and July 15. Resurrection Creek has anadromous fish habitat and the dredging window is imposed by the State of Alaska Department of Natural Resources to protect the salmon.

### *Environmental Consequences*

The Organic Administration Act requires the Forest Service, as the land manager, to minimize environmental impacts without materially interfering with a mining claimant's rights under the General Mining Laws. The 1872 Mining Law, as amended, confers a statutory right upon a mining claimant to enter upon public lands to prospect, develop and mine valuable minerals. A federal mining claim exists on the south boundary of the project area, and care must be taken to respect the claimant's property by avoiding claim corner markers, excavations, and mining equipment. The claimant should also be provided reasonable access routes in order to carry out necessary mineral associated activities.

In addition, much of the project is located on acquired land that is withdrawn from mineral entry, but is available for mineral leasing. A prospecting application has been filed for approximately 108 acres of this land, which runs east of the Haun Trust Lands. If the application is approved, the prospector will require an access route.

Recreational gold panning is a leisure-time activity that is allowed on lands withdrawn from mineral entry. This activity is currently allowed on the acquired land in the project area, and is addressed in the Recreation section.

The qualitative assessment of restoration activities can be measured by accessibility to public lands open to mineral entry and to the acquired lands through leasing or permitting.

### Alternative 1 – No Action Alternative

*Direct and Indirect Effects*

The claimant on the southern boundary would be indirectly affected by the no action alternative in that he would continue to use the existing road through the Haun Trust Lands and the section of the Palmer Creek access road that frequently floods. The claimant would also be indirectly affected by the continued vandalism caused by some recreational gold panners who access Resurrection Creek via the existing road. This area is gated to vehicular traffic, making it difficult for law enforcement to monitor. If the mineral lease for the acquired land is approved the lessee would not be directly affected by this alternative. The lessee would likely request permission to build a road east of the Haun Trust Lands. No cumulative effects are expected from past, present or reasonably foreseeable activities.

### Alternative 2 – Proposed Action

*Direct and Indirect Effects*

The existing claim holder would benefit from the long-term direct effect of road improvement through the Haun Trust Lands and the Palmer Creek Road reconstruction, since he has experienced flooding on the road he currently uses to access his claim. However, the claim holder may experience a negative direct effect from the construction at the confluence of Resurrection and Palmer Creeks

because his claim is located in this vicinity, and his claim markers, excavations and mining equipment could potentially be disturbed. The claimant would indirectly benefit from the closure of recreational gold panning south (upstream) of the Haun Trust Lands, since a closure order would make law enforcement more effective. No cumulative effects are expected from past, present or reasonably foreseeable activities.

### Alternative 3

*Direct and Indirect Effects*

The results of this alternative are similar to those of Alternative 2 regarding the negative direct effect on the claim holder due to construction near his claim and the possibility of damage to his claim markers, excavations and mining equipment. In addition, he would require alternative access to his claim during the relocation of the existing road from the flood plain. In this alternative, new road construction around the east side of the Haun Trust Lands may potentially have a positive indirect effect for the mineral lease applicant on the acquired lands. The applicant would require access to the leased land if the application is approved. He has expressed interest in building a road along the same corridor as the proposed road east of the Haun Trust Lands. Keeping recreational gold panning open in the project area, along with newly constructed roads would indirectly cause a negative effect on the claimant by encouraging traffic and the potential for vandalism on the mining claim. No cumulative effects are expected from past, present or reasonably foreseeable activities.

### Alternative 4

*Direct and Indirect Effects*

The effects of this alternative are the same as Alternatives 2 and 3 for the claim holder in that there is a possibility of damage to his claim markers, excavations, and mining equipment due to construction. In addition, road construction in the flood plain area and equipment crossings may have a direct negative effect by obliterating the existing road used by the claimant to access his claim. The relocation of the road from the flood plain would have a long-term positive effect for the claimant if he is allowed use of the road after the project is completed. Closure of recreational gold panning would have an indirect positive effect by decreasing the volume of traffic through the claim. No cumulative effects are expected from past, present or reasonably foreseeable activities.

### Alternative 5

*Direct and Indirect Effects*

The effects as the result of this alternative would be the same as Alternative 4.

### Alternative 6

*Direct and Indirect Effects*

The direct effect of this alternative would be the disruption of access to the mining claim south of the Haun Trust Lands. The claim holder uses the existing section of Palmer Creek road that is in the flood plain. An indirect positive effect would be that the miner could use the new road upon completion of the project. The closure order for recreational gold panning would have an indirect positive effect by decreasing the volume of traffic through the claim. No cumulative effects are expected from past, present or reasonably foreseeable activities.

## Soils

### *Affected Environment*

The bottom of Resurrection Creek Valley has been heavily mined for gold since the late 1890's. The valley bottom soils are undisturbed in very few locations. The soils developed in sediments deposited in glacial outwash, lakes or small ponds during the recession of the glaciers in the late Wisconsin glacial period that ended about 10,000 years ago. Since that time there has been the erosion from Resurrection Creek and side tributaries that have cut down through the glacial outwash and lake deposits to an incised depth about 75 to 100 feet below the historic glacial age valley bottom. The erosion from these tributary creeks has deposited soil and rock in numerous stream terraces and alluvial fans. Much of this alluvium in the project area has been heavily manipulated by gold mining.

The lowest section of Resurrection Valley, at Hope, AK, is an alluvial fan developed by Resurrection Creek as it flows out of the more confined canyon up stream. The remainder of the landscape in the bottom of Resurrection Creek valley consists of an elevated stream terrace or bench incised down about 75 to 100 feet to a recent stream terrace and flood plain. The upper and lower levels are separated by a steep (45 to 65 percent) stream-cut side-slope. Information on the soils in the upper terrace is in the soils section of the project record as characterized by Davidson, (1989).

The glacial history of the valley is marked by at least three lake/pond deposits where glacial water was dammed by other glaciers, moraines, or some landform for a period long enough for the silt and clay size particles to settle out of the water. Two of these lake deposits are represented by the yellow and blue clays normally found just below the present valley bottom. The gold miners have typically excavated thru the overburden to mine the gold that settled down through the coarse cobbles to the surface these lake sediments. The third deposit is found in many of the soils on the elevated stream terrace. It is easily located where it occurs on relatively level surfaces. Its slow permeability reduces the water drainage thru the soil, causing water to pond and create wetland fens. This lake deposit appears to be quite extensive on the higher terrace in the lower portion of the valley. Its presence is masked on steeper slopes because of better

drainage, allowing the growth of more facultative vegetation that is consistent with more freely drained soils.

There are numerous places along the edge of the upper terrace where ground water that flows along the surface of the lake deposits comes to the surface. During the spring snow melt or periods of long duration rain storms that tend to saturate the soil; this extra water can induce landslides. There are numerous locations of past and present slides that have started at the top of the cut slope and slid part or all the way down the slope to the present valley bottom (Davidson, 1984). Almost every slide can be traced to a source of water, other than rain, flowing on the top of the buried lake deposits. These sites are highlighted by an increase in cottonwood trees that form a line down the slope similar to nearby to stream corridors.

### *Environmental Consequences*

A major portion of the proposed soil disturbance in the Resurrection Creek restoration project would be on soils previously disturbed by multiple placer gold mining operations throughout the 1900's. A major portion of the disturbed area has not returned to a revegetated state or to the productivity level of the soil prior to the original mining disturbance. This proposed project provides the opportunity to enhance soil productivity and the reestablishment of vegetation on the mining disturbed sites.

Creation of a broad floodplain along Resurrection Creek within the project area will allow for deposition of fine-grained sediments and organics on the floodplain during larger flood events. This deposition, along with accumulations of leaf litter and woody debris on the floodplain will lead in the long-term to development of deep, productive soils on the floodplain.

Soil disturbance will result from the following types of activities proposed in the project.

- Top soil removed from selected sites will reduce the long-term productivity of the remaining subsoil. If and where these areas are converted to wetlands the productivity will be an irreversible and irretrievable loss.
- Construction of roads, trails, and water channels will result in a loss of on-site soil productivity.
- Loss of soil productivity from road construction and in the river channel will be irretrievable.
- Loss in productivity on the disturbed sites where gravels will be moved will be variable from medium to long-term depending on the time for vegetation to become established relative to the desired final plant community.

## Alternative 1 – No Action Alternative

*Direct and Indirect Effects*

There will be no additional effects to either soil disturbance or soil productivity in this alternative. Soil productivity will increase slowly depending on 1) the stage of plant succession and the time since disturbance, and 2) the soil/gravel conditions remaining from the original mining. There will be no change in the natural erosion that is presently occurring in the project area. Recreational gold panners may continue to mine small amounts of soil. The extraction sites are small and can cause some bank erosion.

*Cumulative Effects*

The proposed project area is a portion of approximately five miles of Resurrection Creek's floodplain that have been highly disturbed by historic placer mining activities. At the time of the mining, much of the riparian soils horizon was stripped off to expose the underlying gravels for mining. Little has occurred to replace the original soils, and the disconnection of the stream from its floodplain has kept riparian soils from redeveloping. The quality and quantity of soil in the mined areas is generally quite poor. Alternative 1 would retain the separation of Resurrection and Palmer Creeks from their floodplain through the Project Area, continuing the cumulative impact to the riparian soils layer along Resurrection Creek.

Recreational mining along Resurrection and Palmer Creeks would likely continue to degrade streambank soils along some stream sections. This effect would be relatively small related to the whole of the historic mining effects, but would act cumulatively in further degrading riparian soils.

## Alternative 2– Proposed Action

*Direct and Indirect Effects*

Loss in soil productivity will result from the construction of 0.35 miles of new road and relocation and relocation of 0.3 miles of trail, the restoration of 1.1 miles of stream channel, disturbance to an estimated 7.59 acres of surface, and the construction of a new parking area for campers with the disposal of extra tailings. An estimated 3,060 cubic yards of top soil would be necessary to cover the disturbed area for revegetation. There would be an area of soil extraction proportional to the amount of top soil necessary to meet the revegetation objectives.

The cumulative surface area over which soil disturbance would occur is about 9.01 acres. About 1.42 acres of the disturbance will be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

*Cumulative Effects*

By directly replacing soils into the floodplain, Alternative 2 would have a short and long-term benefit to vegetation health within riparian areas along Resurrection and Palmer Creeks. This soils/vegetation benefit would be substantially enhanced over time by the deposition of fine-grained sediments and organics on the floodplain during flood events. This would reduce the mining related cumulative effects to riparian soils. Restricting recreational mining within a portion of the project area would also reduce adverse impacts to riparian soils related to mining into streambanks.

Alternative 2 would extract soil from upland sites for use on newly created floodplain areas. This, along with road and parking area development would adversely impact soil productivity at these sites, however, the floodplain area benefited by the soil spreading would be more than double that impacted. Impacts to upland sites can be limited by using waste soils from alternate sites such as highway expansion projects. This alternative is not expected to cause long-term detrimental impacts to soils resources in the Resurrection Creek watershed.

## Alternative 3

*Direct and Indirect Effects*

Loss in soil productivity will result from the construction of 1.05 miles of new road, the restoration of 0.9 miles of stream channel, disturbance to an estimated 7.59 acres of surface, and the construction of a new parking area for campers with the disposal of extra tailings. An estimated 3,060 cubic yards of top soil would be necessary to cover the disturbed area for revegetation. There would be an area of soil extraction proportional to the amount of top soil necessary to meet the revegetation objectives.

The cumulative surface area over which soil disturbance would occur is about 10.77 acres. About 3.18 acres of the disturbance will be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

*Cumulative Effects*

Similar to Alternative 2, Alternative 3 would reduce cumulative soils impacts within riparian areas due to the creation of new floodplains and their associated soils layers. The total benefit to floodplain soils would be reduced from Alternative 2 since no floodplain restoration would occur on private lands, and recreational mining might adversely impact and erode soils in restored floodplain areas. Alternative 3 would adversely impact upland soils due to soil extraction efforts, and development of new roads. This alternative proposes the greatest amount of new roads and would have the greatest cumulative impact to upland soils of all the alternatives.

As in Alternative 2, the area of riparian soils benefited by the Alternative would exceed the area of upland soils impacted by soil extraction and roads. Importing

soils from alternate sites would reduce impacts to upland excavation areas. This alternative is not expected to cause long-term detrimental impacts to soils resources in the Resurrection Creek watershed.

### Alternative 4

*Direct and Indirect Effects*

Loss in soil productivity will result from the construction of 0.75 miles of new road, 220 feet of temporary road, and 0.4 miles of temporary trail, the restoration of 0.9 miles of stream channel, disturbance to an estimated 6.94 acres of surface, and the construction of a new parking area for campers with the disposal of extra tailings. An estimated 2,800 cubic yards of top soil would be necessary to cover the disturbed area for revegetation. There would be an area of soil extraction proportional to the amount of top soil necessary to meet the revegetation objectives.

The cumulative surface area over which soil disturbance would occur is about 9.69 acres. About 2.75 acres of the disturbance will be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

*Cumulative Effects*

As with Alternatives 2 and 3, Alternative 4 would have a net benefit to project area soils and would not cause long-term detrimental impacts to overall soil quality in the Resurrection Creek watershed. Benefits to riparian soils would be greater than in Alternative 3 due to the restrictions on recreational mining related disturbance. Impacts to upland soils would be less than in Alternative 3 due to less proposed road construction, and generally poor existing soil quality where roads specific to the alternative are proposed.

### Alternative 5

*Direct and Indirect Effects*

Loss in soil productivity will result from the construction of 0.35 miles of road, and 0.3 miles of new trail (replacing an existing trail segment), the restoration of 0.6 miles of stream channel, and disturbance to an estimated 3.10 acres of surface. An estimated 1,250 cubic yards of top soil would be necessary to cover the disturbed area for revegetation. There would be an area of soil extraction proportional to the amount of top soil necessary to meet the revegetation objectives.

The cumulative surface area over which soil disturbance would occur is about 4.52 acres. About 1.42 acres of the disturbance will be permanent and irreversible. The remainder will be revegetated to meet the desired future revegetation conditions.

*Cumulative Effects*

As with all the action alternatives, Alternative 5 would have a net benefit to project area soils and would not cause long-term detrimental impacts to overall

soil quality in the Resurrection Creek watershed. Benefits to riparian soils would be similar to Alternative 2, but considerably smaller in scale since only about half the amount of floodplain would be treated. Likewise, impacts to upland soils would be less since less soil extraction would be needed for floodplain recovery.

### Alternative 6

*Direct and Indirect Effects*

Loss in soil productivity will result from the construction of 0.75 miles of new road, 220 feet of temporary road and 0.4 miles of temporary trail, the restoration of 0.5 miles of stream channel, and disturbance to an estimated 4.46 acres of surface. An estimated 1,800 cubic yards of top soil would be necessary to cover the disturbed area for revegetation. There would be an area of soil extraction proportional to the amount of top soil necessary to meet the revegetation objectives.

The cumulative surface area over which soil disturbance would occur is about 7.06 acres. About 2.6 acres of the disturbance will be permanent and irreversible. The remainder would be revegetated to meet the desired future revegetation conditions.

*Cumulative Effects*

As with all the action alternatives, Alternative 6 would have a net benefit to project area soils and would not cause long-term detrimental impacts to overall soil quality in the Resurrection Creek watershed. Benefits to riparian soils would be similar to Alternative 4, but considerably smaller in scale since only about half the amount of floodplain would be treated. Likewise, impacts to upland soils would be less since less soil extraction would be needed for floodplain recovery.

### Irreversible and Irretrievable Commitments of Resources

All soil that is removed or covered as a result of road construction and parking area development will result in irreversible and irretrievable loss in the productive capacity of the soil.

**Figure 4 Large Tailings Pile**

# Biological Environment

## Aquatic Resources and Hydrology

### *Affected Environment*

The Resurrection Creek watershed is located in the Kenai Peninsula in south-central Alaska near the community of Hope. It is a tributary to the Turnagain Arm of Cook Inlet. The watershed covers 103,230 acres (161.2 sq. mi.) within the Western Kenai Mountains Eco-section, a subsection of the Kenai Mountains Section.

Both anadromous and resident fish utilize Resurrection Creek. Four species of anadromous salmonids are present in Resurrection Creek and include: pinks (*Oncorhynchus gorbuscha*), chum (*Oncorhynchus keta*), coho or silver (Oncorhynchus kisutch) and chinook or king (*Oncorhynchus tshawytscha*). Pink salmon are the most abundant species with runs estimated at 20,000 to 35,000 returning adults in even-numbered years. Chum salmon are much less numerous, with about 200 adults returning yearly. Annual coho peak counts on Resurrection Creek range from 100 to 500 returning adults. Chinook counts range from less than 100 to upwards of 500 returning adults.

Resident fish include Dolly Varden (*Salvelinus malma*), whitefish (*Prosopium sp*), sculpin (*Cottidae spp.*), and stickleback (*Gasterosteidae spp)*. While Dolly Varden is known to be present, there is no information about their population status in the Resurrection Creek watershed. There are no population data on rainbow trout. The lower six river miles of Resurrection Creek have been identified as critical habitat for spawning and rearing habitat for coho, chum, pink and chinook salmon (Crowser, RCLA, 2002)

### Listed, Proposed and Candidate Species

There are no federal or state listed, proposed or candidate aquatic species located in the project area or that would otherwise be affected by this alternative.

Threatened and endangered salmonid species in Oregon and Washington include coho, chinook, chum and pink, all of which are found in the Resurrection Creek watershed. Species of fish such as salmon have the ability to re-colonize areas of suitable habitat. As stocks have dwindled in the Pacific Northwest, healthy fish stocks within Alaska and streams such as Resurrection Creek become increasingly important for both research and as a source of wild genetic stock.

### Watershed Morphology

Topography of the watershed consists of rounded, frost churned mountaintops separated by valleys shaped by alpine glaciers are characteristic of the Western Kenai Mountains Eco-section (Davidson 1996). Resurrection Creek lays in a large, glacially formed, U-shaped valley with a SSW-NNE trend.

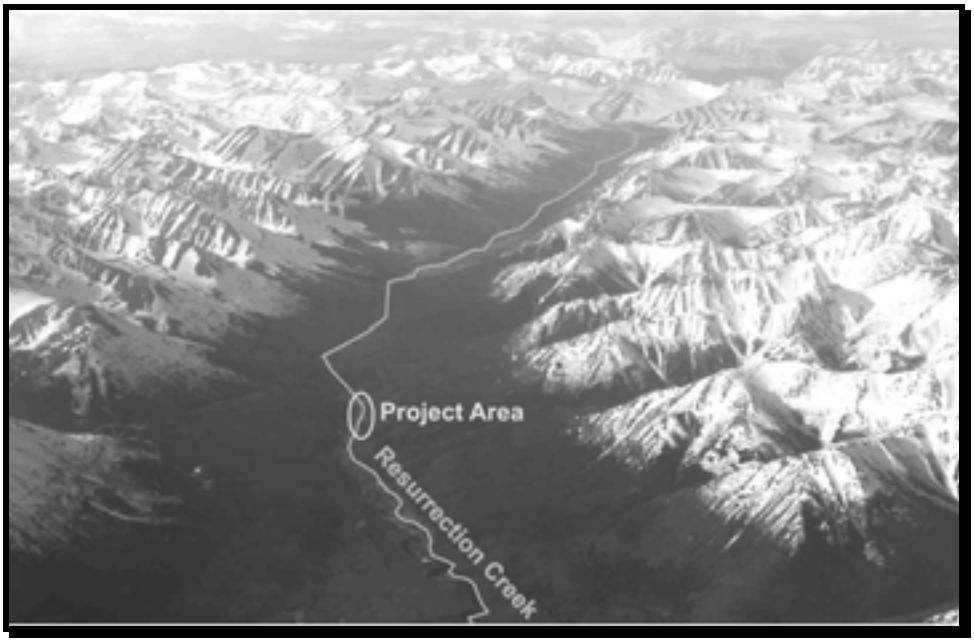



**Figure 5 Aerial Oblique Looking south up Resurrection Creek Valley**

Resurrection Creek, for much of its length, has incised some 50 to 100 feet into alluvial gravels, and in several instances, bedrock. The incision left a pronounced terrace on either side of the creek. This terrace likely relates to flow conditions that persisted when the large glacier filling Resurrection Creek began to recede. During this glacial recession, Resurrection Creek and its major tributaries would have had both flows and sediment loads much greater than at present. Alluvial sediments likely aggraded (deposited) on the valley bottom. Large alluvial fans deposited where larger tributary valleys joined the Resurrection.

Since the departure of the glaciers, Resurrection Creek's sediment load and flood peaks have greatly diminished, and the creek has cut down into both alluvial sediments and in some areas bedrock. This incision has left the terraces seen today. Where it has cut into alluvial gravels, Resurrection Creek has generally had time to widen out a new valley bottom with a floodplain. Where it has cut into resistant bedrock, the creek forms a V-shaped valley with very little adjacent floodplain.

Through the project reach, Resurrection Creek has widened the valley bottom from 400 to 650 feet. At the upper end of the project area, Resurrection Creek leaves a bedrock canyon where the valley bottom width is about 75 feet.

## Mining

Resurrection Creek was home to Alaska's first gold rush. Portions of Resurrection Creek's main stem and tributaries have been mined for gold using various techniques. The majority of impacts to the stream channels and riparian

areas in the project reach arose from hydraulic placer mining, which occurred mostly in the first two decades of the 1900's. Tailings generated from hydraulic mining rise to as much as 25 feet high, and occupy the majority of the alluvial valley bottom within the project area.

### Flood Prone Entrenchment Ratio

Entrenchment ratios are based on measurements associated with the bankfull or effective discharge width vs. flood prone width and is an important characterization of channel morphology and stream classification (Rosgen, 1996). It is also used with other measures to determine the stability of the stream channel. Modification of the geomorphology within the project area from mining activity has altered elevations related to the effective discharge. These changes have created an entrenched channel unable to access its floodplain. In addition, entrenchment ratio, a measure of floodplain accessibility and inundation (floodprone width divided by bankful width), has been reduced from 7:1 to within the project reach. This entrenched nature inhibits fine sediment and nutrient replenishment along Resurrection Creek's riparian area leading to extremely slow rates of revegetation.

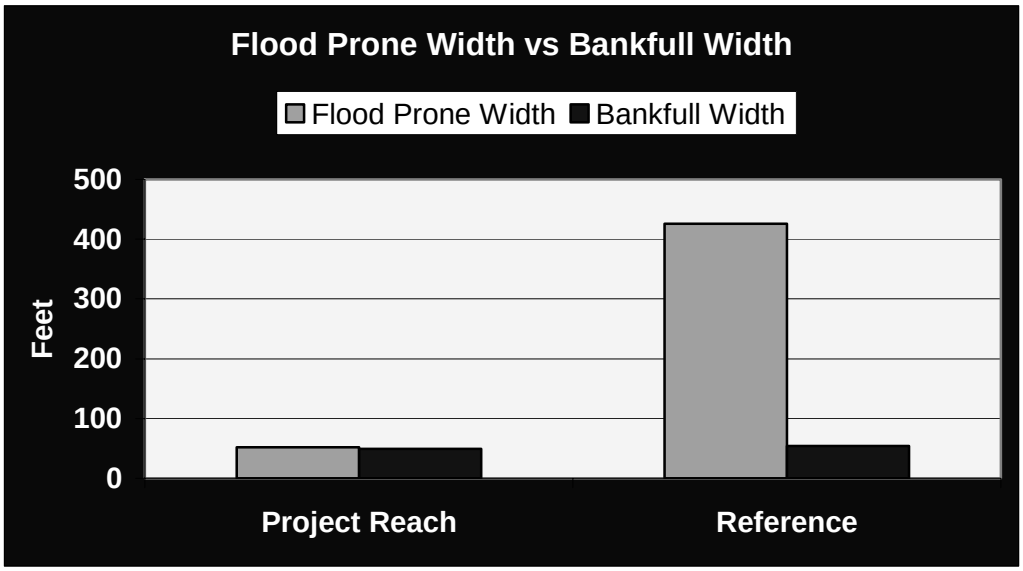



**Figure 6 Flood prone and bankfull widths for the disturbed project area and reference reaches of Resurrection Creek, Kenai Peninsula, Alaska.**

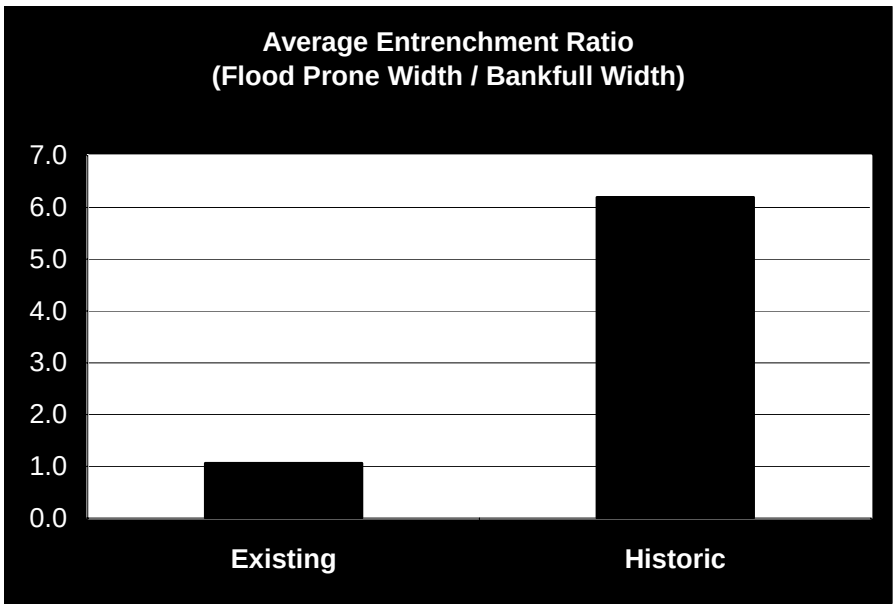



**Figure 7 Average existing and historic entrenchment ratios for the project area of Resurrection Creek, Kenai Peninsula, Alaska.**

In contrast to the reference reach, the tailings piles within the project area confine all flood flows into a single thread channel roughly the same size as the normal bankfull channel. The tailings piles are essentially functioning as dikes that cutoff the flood flows from the original floodplain. Water velocities accelerate as they are compressed through the constricted channel concentrating the stream's energy on the streambed, simplifying substrate and degrading the channel. Sediment and nutrients are transported through the project area depriving riparian areas of soil and nutrients, which in turn retard disturbance recovery and natural succession.

### Stream Channel Slope and Substrate Composition

Channelization of the stream has also caused an increase in stream gradient or slope. Bair (2001) measured a 25% increase in channel slope on Resurrection Creek through the project area due to reduced stream sinuosity. This steeper channel slope has caused an increase in in-channel stream velocities.

Increased flow velocities within the project area create increased shear along the bed and banks of Resurrection Creek. This has caused a general increase in the size of channel substrates.

In 2002, fine sediment and gravel size material were evaluated in the project reach and compared to a relatively undisturbed "reference reach" upstream at approximately river mile 8 (Bair, 2002). Based on comparisons with the reference

reach, the project area has degraded as a result of confinement and is fine grain substrate limited.

Palmer Creek is Resurrection Creek's largest tributary and joins Resurrection Creek partway through the project area. Palmer Creek has a watershed area of 20.9 square miles.

Upstream reaches of Resurrection Creek are mostly moderate gradient (2 to 5%) channels capable of transporting sediment. Downstream reaches are lower gradient (<2%) flood plain channels where alluvial deposition and flood plain development are evident. Several short reaches of Resurrection Creek are contained within narrow canyons.

Using Rosgen channel types (Rosgen, 1995), the majority of mainstem Resurrection Creek is classified as a "C" channel type. Segments of both "B" and "F" channel types are found where gradients are steeper, and/or the channel incises into bedrock or course alluvium. The proposed stream restoration project reach was formerly a "C" channel with a large established floodplain. Placer mining changed the channel primarily to an "F" channel-type, with little developed floodplain.

### Off-Channel Habitat

Off-channel habitat in the project reach consists mainly of tailings ponds originally created for settling fine sediment and contaminants during gold mining activities. Past projects have attempted to reconnect existing off channel ponds with some success. However, because the mine tailing are unable to support much vegetation, off channel habitat remains in less than optimal condition and will continue in this state as long as hydrologic and geomorphic function remain impeded. A comparison of the project reach with a representative reference reach show a simplified channel, with few high flow refugia and limited suitable rearing habitat for fish (Bair, 2002).

The project area and reference reach have similar valley slopes and widths. However the two reaches are vastly different systems in both form and function. The differences in bankfull width/floodplain width graphically illustrate the constriction of the stream channel and loss of floodplain due to the mine tailings (figures 6 & 7). The reference reach has a floodplain width eight times the normal bankfull width of the stream channel during flood flows greater than a 3-year event. When floods occur they spread out over the floodplain, allowing the stream to disperse, dissipate and reduce stream power. Inundation of the floodplain also augments and fertilizes riparian areas by depositing fine sediment and organics. Sheet flow across the floodplain also creates a complex of side channels and off channel habitat that are critical for salmonid spawning and rearing.

In 1990 – 1992 the USFS conducted an evaluation of the Resurrection Creek fisheries. The study evaluated juvenile salmon distributions, smolt out-migrations, and inventoried stream habitat. The results of the study were compared to three other stream systems on the Kenai Peninsula; Hidden, Moose

and Quartz Creek. The results showed that Resurrection Creek coho smolts were considerably smaller by age class (about 30%) than on the other streams. Virtually all Resurrection Creek coho smolts were emigrating at age 1, while 90% of coho smolts on the other streams emigrated at age 2 and 3 (Blanchet and Wenger, 1993).

The lack of growth and early-age at which coho smolts emigrate from Resurrection Creek give very strong indication that rearing within the system is severely limited. The tailings piles within the placer mined reaches have disconnected the stream from the historic floodplains and side channel habitat. The side channels and alcoves within the now isolated or buried floodplains historically provided the flood flow refugia and over wintering habitat which were critical to salmonids, especially coho.

### Spawning Habitat

Pebble counts and ocular estimates were used to estimate the quantity of spawning gravel within the project reach during the 2002 restoration analysis. Approximately 160 $yd^2$ was estimated in 0.9 river miles of the project reach. The spawning gravel was isolated to one small patch in the disturbed reference area at approximately river mile 5.4. The spawning gravel existed in the only section of the project area where the stream was not entrenched and had access to a defined floodplain. The reference reach, surveyed on the Resurrection Creek in 2002 provides 85% more spawning gravel per mile, than within the project area.

### Large Woody Debris

Bair (2002) found a greater than thirty-fold decrease in large wood in the channel at the project reach when compared to an upstream (unmined) reference reaches. Large woody debris (LWD) is an important component for fish habitat. It has both direct and indirect benefits to fish species. Its role in trapping and slowing sediment movement is critical to creating spawning sites. In addition, LWD is also important in the creation of a diverse range of habitats, from pool formation to areas of high flow refuge.

Large woody debris is defined here as pieces of wood >12” in diameter, >65’ in length. Large wood has both physical and biotic functions within salmonid streams. The physical effects LWD has on streams include changes in stability of stream banks and channels, storage of sediment, dissipation of stream energy, and alteration of channel flows (Bryant, 1983, Everest and Meehan 1981, Harmon et al 1986).

During this analysis, the amount of LWD per mile was measured within undisturbed steams with the Resurrection Creek Basin. It was found that undisturbed channels with the same characteristics as the project reach contained on average 300 pieces of LWD per river mile (USDA Forest Service, 2002). In contrast, only 13 pieces of large wood greater than 12” in diameter per river mile were found within the bankfull channel of the project reach. Chugach

National Forest Seward Ranger District personnel installed the majority of wood observed in the project reach for fish habitat enhancement. The constricted channel in the project reach flushes large woody debris and other organics such as salmon carcasses downstream during peak flow events much like a log flume.

This loss of in-channel wood is likely related to both the lack of large vegetation along the banks of the project reach, and the inability of wood coming from upstream to lodge in this channel section (due to the high stream shear). Loss of large wood in the project reach means reduced pool formation, and reduced nutrient availability to rearing fish. Reductions of in-stream pools adversely affect the quality of both spawning and rearing habitat.

### Pool Frequency and Quality

Pools are an important component of fish habitat providing a place for fish to feed, rest, and hide from predators. Pools are areas of the stream with reduced water velocities that are typically deeper than the surrounding areas, and have a smooth surface. Pools are created by structure (such as large woody debris along the banks and/or in-channel) that scour or impound water during peak flows. As peak flows recede, pools become deposition areas for fine sediment. The quality of pool habitat (pool quality) can be reduced if sediment loads are increased by landslides and other forms of erosion. Pools can also be lost if the stream channel is confined or structural material such as LWD is removed.

The confinement of the stream channel and increase in channel slope in the project reach has created a nearly continuous riffle with very few pools. Four pools with residual pool depths greater than three feet were measured in one mile of stream (approximately five pools per river mile). In contrast, the reference reach contained 16 pools/ river mile. Most of the pools observed in the reference reach were associated with large woody debris and or mature riparian vegetation.

Within the project reach, three pools with residual pool depths greater than three feet were measured in one mile of stream. In contrast, the reference reach contained 17 pools/ river mile. Most of the reference reach pools were associated with large woody debris and/or mature riparian vegetation. The lack of pools within the project area limits resting and rearing habitat for juvenile and adult salmonids.

### Surface Water

The US Geological Survey collected 18 years of streamflow data on Resurrection Creek at a gauging station located two miles upstream from the creek's mouth on Turnagain Arm. Figure 8 shows the location of the USGS gauging station and the proposed stream restoration project area, and the watershed area above the gage and the lower and upper project.

Average annual flow at the USGS gage on Resurrection Creek is 275 cubic feet per second (CFS) (VanMaanen, et al, 1988), or 1.85 CFS/sq. mi. The drainage area at the gage is 149 sq. mi., (92.5% of the full watershed.)

Bankfull discharge at the USGS gage on Resurrection Creek is comparable to the 1.5 year recurrence flood event at around 980 CFS, or 5.4 CFS/square mile.

Resurrection Creek shows two distinct high flow periods. One period relates to snowmelt and the other to late summer/fall rainstorms. Snowmelt runoff generally starts in early May, and the peak flow period lasts from early June through mid-July. Warm, sunny periods and late spring and summer rainstorms can briefly increase the size of snowmelt peaks.

Large peak flow events can also occur from August through October in response to heavy coastal storms that move inland. The peak flow of these rainfall events generally only lasts for a few hours (or less), and the high water period generally for 1 to 3 days.

The annual peak flow on Resurrection Creek is a spring/summer snowmelt peak in some years, and late summer/fall rainfall peak in others, with about 2/3 being snowmelt or rain-enhanced snowmelt peaks. Table 2 shows the annual peak flows on Resurrection Creek for the period of record.

**Table 2– Instantaneous Annual Peak Flow for Resurrection Creek**

| Water Year | Date | Streamflow (CFS) | | Water Year | Date | Streamflow (CFS) |
|---|---|---|---|---|---|---|
| 1968 | Jun. 15, 1968 | 1,020 | | 1977 | Jun. 18, 1977 | 1,980 |
| 1969 | Jun. 16, 1969 | 939 | | 1978 | Sep. 13, 1978 | 1,040 |
| 1970 | Oct. 06, 1969 | 2,700 | | 1979 | Jun. 25, 1979 | 1,010 |
| 1971 | Aug. 09, 1971 | 2,300 | | 1980 | Jul. 12, 1980 | 3,380 |
| 1972 | Jun. 16, 1972 | 1,030 | | 1981 | May 30, 1981 | 1,310 |
| 1973 | Oct. 16, 1972 | 664 | | 1982 | Nov. 10, 1981 | 1,180 |
| 1974 | Jun. 12, 1974 | 711 | | 1983 | May 31, 1983 | 1,220 |
| 1975 | Jun. 30, 1975 | 1,240 | | 1984 | Jun. 23, 1984 | 686 |
| 1976 | Sep. 22, 1976 | 2,110 | | 1985 | Jul. 01, 1985 | 1,300 |

(USGS Station # 15267900) operated 10/1/1967 to 3/31/1986

Resurrection Creek peak flow of record (1967 to 1986) was 3380 CFS on 7/12/1980. Unit runoff to this peak is 22.7 CFS/sq. mi. The ten-year flood for Resurrection Creek at the USGS gage site rates out at approximately 2400 CFS (16.1 CFS/sq. mi.) Table 3 shows floods of different recurrence intervals at the USGS gage, and then extrapolates these flood events to the project area both upstream and downstream from Palmer Creek. Bankfull discharge is frequently related to the 1.5-year flood event. The calculated bankfull flow on the lower portion of the project area below Palmer Creek is 921 CFS while above Palmer Creek it is 783 CFS.

The time of year with lowest streamflows on Resurrection Creek is usually from February into mid-April. The lowest daily flow recorded (early April 1985) was 38 cfs, or 0.26 CFS/sq. mi.

**Table 3 Resurrection Creek Flood Recurrence Intervals**

| Flood Recurrence Interval | Exceedence Probability | Resurrection Creek Flood Flows In Cubic Feet per Second (CFS) | | |
|---|---|---|---|---|
| | | At the USGS Gauging Station (149 sq.mi.) | *At the Lower Project Area (140 sq.mi.) | *At the Upper Project Area (119 sq.mi.) |
| 1.25-Year | 0.8 | 858 | 806 | 685 |
| 1.5-Year | 0.67 | 980 | 921 | 783 |
| 2-year | 0.5 | 1230 | 1156 | 982 |
| 5-year | 0.2 | 1873 | 1760 | 1496 |
| 10-Year | 0.1 | 2393 | 2249 | 1911 |
| 25-Year | 0.04 | 3170 | 2979 | 2532 |
| 50-Year | 0.02 | 3844 | 3612 | 3070 |
| 100-Year | 0.01 | 4606 | 4328 | 3678 |
| 200-Year | 0.005 | 5469 | 5139 | 4368 |
| 500-Year | 0.002 | 6791 | 6381 | 5424 |

**Flow estimates at the lower and upper portions of the Project Area are calculated based on the records from the USGS gage, times the percent of the USGS stream gage watershed area.*

Using Log-Pearson Analysis of Resurrection Creek stream flow records

(USGS Station # 15267900) operated 10/1/1967 to 3/31/1986

### Water Quality / Sediment / Turbidity

Sediment and sediment transport are natural processes that provide streams with a source of substrate and nutrients. Sediment is naturally delivered to streams by a variety of mechanisms such as landslides and banks erosion. All streams and their associated aquatic organisms evolve to a natural “sediment load” or regime.

The sediment load is the quantity and size of the material a stream typically transports. The sediment regime and composition determines the quantity and quality of aquatic habitat such as spawning gravel. When streams or watersheds are disturbed by activities such as mining, logging, or road construction, excess sediment can be delivered to the stream, altering both the quantity and composition of the substrate. This shift in the sediment composition can directly and indirectly affect aquatic organisms by altering water quality, incubation, larval development, juvenile rearing and spawning habitat.

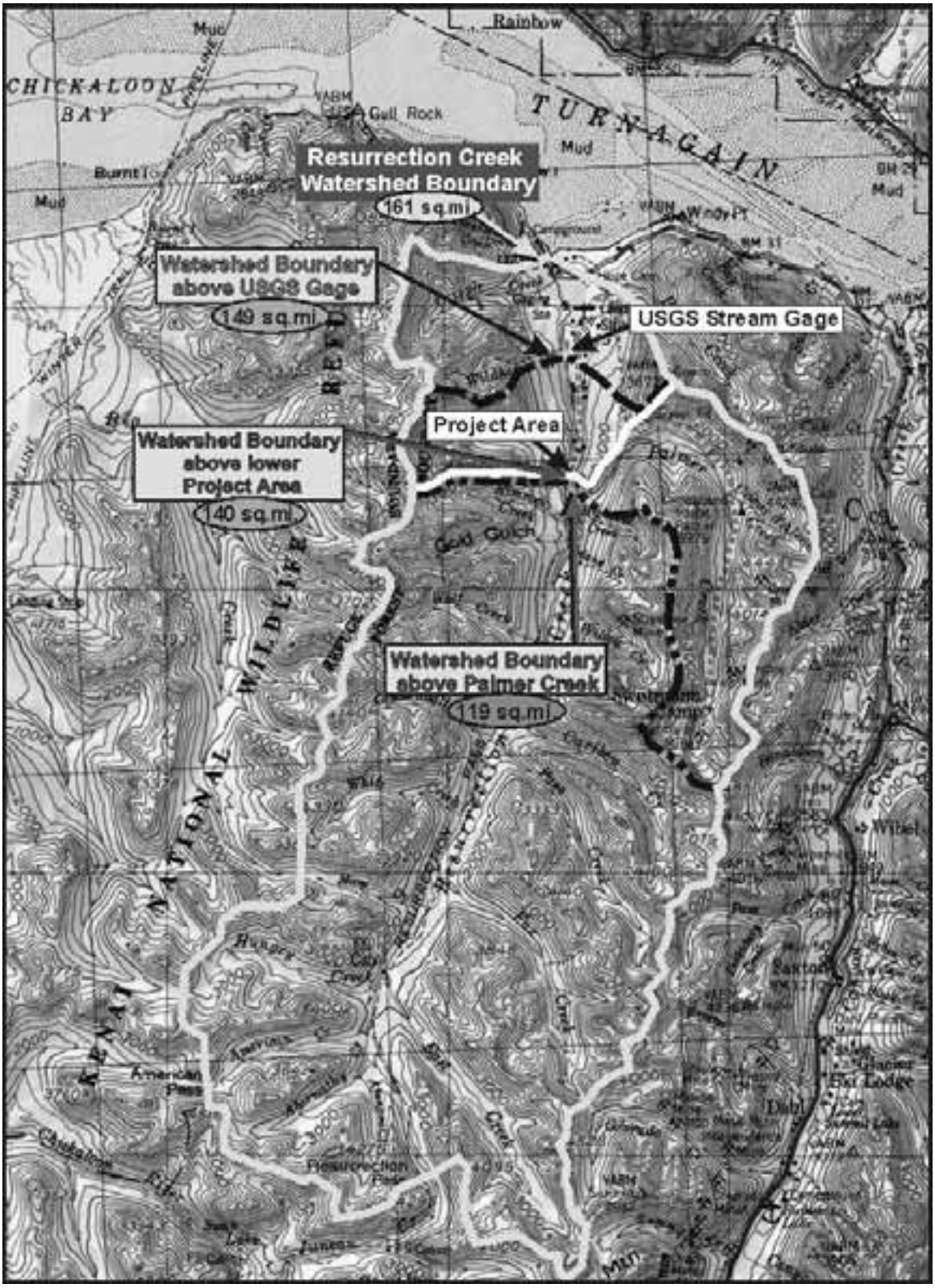



**Figure 8–Watershed Boundaries and Drainage Areas**

1) All of Resurrection Creek, 2) Resurrection Creek above USGS gauging station,
3) Resurrection Creek at the lower portion of the Project Area, and
4) Resurrection Creek at the upper Project Area (upstream from Palmer Creek.)

Turbidity is the visible suspension of smaller particles of sediment typically carried by all streams. Turbidity meters measure the clarity of the water and assign a NTU (nephelometric turbidity units) value the turbidity level. Turbidity levels are typically tied to stream flow levels. At higher flow levels, sediment inputs are usually greater, and streams are better able to entrain and maintain finer sediments in suspension. Prolonged exposure to high turbidities/suspended sediment can kill aquatic organisms by reducing growth rates and resistance to disease, by preventing successful development of eggs or larvae, by modifying natural movement or migration patterns, or by reducing the natural availability of food (EPA, 1986).

Water quality data was recorded in Resurrection Creek at two different stations. Data was recorded at station number 15268000 between July 1950 and September 1959. A total of 10 measurements were recorded during that time period. Data was also recorded at station number 15267900 between June 1968 and May 1971. A total of 25 measurements were recorded during that time period.

The water quality data collected shows no violations of State Water Quality Standards established for growth and propagation of fish, shellfish, other aquatic life, and wildlife (Alaska Department of Environmental Conservation, 1999).

### Flood Concerns on Haun Trust Lands

Public scoping on the project raised a concern that redeveloping the Resurrection Creek channel and floodplain upstream of the Haun Trust Lands could create additional flooding problems on the Haun Trust Lands.

In either 1980 or 1981, a lessee on the Haun Trust lands diverted Resurrection Creek out of its channel on the east side of the valley bottom over to an older, mining-created channel on the west side of the valley bottom. A berm was built at this time at the upper end of the diversion, to keep Resurrection Creek from flooding into its former channel. However, at the time, some flow from Resurrection Creek was allowed to spill into the old channel. Overspill flows in the former channel were maintained for several years. The overspill waters were likely intended for mining operations on the Haun Trust lands. Portions of the former channel became (or possibly were further excavated into) ponds.

The flood control berm built at the head of the diversion is low enough that higher flows on Resurrection Creek continue to spill into the old channel. This flooding apparently is a hazard to facilities on the Haun Trust Lands. The landowners are concerned that restoration actions by the Forest Service might further increase the existing flooding occurring on their property.

## Heavy Metals

*Mercury:* Mercury has been used historically in placer mining operations around the world. It was used particularly heavily in California during the period from 1849-1880. Mercury was likely used during historic placer mining on Resurrection Creek, but we have not been able to find records of the quantities of mercury used.

Placer mining operations used elemental (liquid) mercury for separating fine gold from the “black sands”. Black sands are the densest minerals/materials (including gold) that settle out in the riffles of the sluice box after a volume of gravel has been washed through the sluice box. Placer gold can be separated from the black sands by panning or using other density separation techniques.

Panning is used to separate particles in the black sands by density, with gold generally having the highest density (13 times more dense than water). However, panning and other physical separation techniques can take arduous hours of work, particularly for separating out fine gold.

When elemental mercury and grains of gold are mixed together, they bond together in a gold/mercury amalgam. The amalgam forms into clumps or beads that can readily be sorted out, greatly speeding up the gold separation process. Carl Persson, a mining geologist with the Bureau of Land Management (BLM) in Anchorage indicates that some Alaskan miners in the early part of the 1900’s poured mercury directly into their sluice box riffles during the sluicing process, in an effort to retain fine gold flakes moving through the sluice. An additional technique used by Resurrection Creek placer miners was to place a copper plate in the last riffle of the sluicebox, and coat the plate with mercury. Again, fine gold passing through the sluice would be “captured by the mercury and eventually the mercury would be removed from the copper plate to process the amalgam.

Once the mercury/gold amalgam is separated from the black sands it can be further separated back into its elemental gold and mercury components through a distilling process. Historically, the amalgam was mixed with an acid and heated. This allowed the mercury, with its low boiling point, to vaporize, leaving only the gold. Traditionally this processing was done with a retort in a gold house, or alternatively with a small retort over a fire, or even in an open pan over a fire. In a retort, the mercury vapor is cooled and condenses back to elemental liquid mercury that can be reused. The mercury vapor itself can be quite toxic and can methylate into toxic methyl mercury compounds.

We do not know how much mercury may have been used for placer mining on the project site, or how carefully it was saved and reused. Some elemental mercury was likely spilled during mining on Resurrection Creek, and some mercury vapor may have deposited during the gold processing. Elemental mercury spilled on site would likely have broken into beads, which generally would work their way down through alluvial gravel deposits until being stopped by a bedrock or false bedrock layer.

On the Project Site, we have concerns that past mining practices may have left toxic mercury compounds that could pose a threat to fish and other aquatic biota.

Additionally, re-contouring of the flood plain could have the possibility of liberating existing mercury sources and allowing them to become more available or more toxic. Onsite mercury would pose potential hazards to humans if it were available through drinking mercury-contaminated water, or consuming mercury-contaminated fish. To this end, the Forest Service designed and conducted a study looking at mercury in resident fish within the project area and in an un-mined upstream control site (MacFarlane, January 2004). The study looked primarily at sculpin, both within the main channel of Resurrection Creek, and in recently constructed side sloughs adjacent to the Creek.

Sampled sculpin were tested for total mercury content. MacFarlane found very low mercury concentrations in the tissues of main channel sculpin within the (mined) project reach. These main channel sculpin from the project reach had similar body mercury concentrations to sculpin found in upstream (un-mined) side channels. Mercury concentrations in sculpin tissue in constructed side channels within the project area averaged two to four times higher than in the main channel of Resurrection Creek. However, these side channel mercury tissue concentrations remain very low, well below the “action level” set by EPA for human consumption of fish.

Coho salmon fry captured in the side slough channels were also tested for mercury. Mercury levels in these salmon fry were about half those found in the side channel sculpin. We believe the low mercury concentrations found in these coho fry present a negligible risk from a sportfishing or subsistence standpoint. The returning adult salmon not only have increased their body weight by two to three orders of magnitude since leaving Resurrection Creek, but have sloughed off virtually all the mercury related to their initial freshwater life phase in Resurrection and Palmer Creeks. Results and analysis of the fish tissue sampling for mercury on Resurrection Creek are available online at:

http://www.fs.fed.us/r10/chugach/pdf/res_creek_pdf/Mercury_in_fish_Res.pdf

Mercury can pose a threat to the survivability of coho fry (and eggs) in that the salmon in these younger life phases are more susceptible to mercury toxicity. However, the tissue concentrations of mercury found in coho fry in the side sloughs were substantially below toxic levels determined for sockeye and pink salmon eyed eggs in Servizi and Martens (1978).

Potential mercury in drinking water appears to be a negligible risk. Elemental mercury is highly insoluble in water. Mercury found in (unfiltered) water samples is generally attached to either organic or inorganic particles in the water. Runoff from the project area is slight, and is hugely diluted by water coming from elsewhere in the 161 square mile Resurrection Creek drainage. Unfiltered water samples collected in both the main channel and side sloughs of Resurrection Creek showed low mercury concentrations ranging from 0.005 to 0.007 parts per billion (ppb) total mercury. In these samples, 1.6 to 2.6 percent of the total mercury was methyl-mercury. Alaska State drinking water standards for total mercury are 2 ppb, nearly 300 times greater than the highest concentration samples from Resurrection Creek. Alaska State standards for fish propagation

are 0.77 ppb, over 100 times greater than the highest concentration samples taken from the Resurrection Creek project area.

As indicated by the fish tissue samples, little mercury appears to be getting into the fish from the water. The most probable pathway for mercury into fish in Resurrection Creek side sloughs is food sources such as macroinvertebrates, other fish, and organics, as well as sediments that pass through the fish.

Sediment samples collected in Resurrection Creek side sloughs in the spring of 2004 were analyzed for total and methyl mercury. No specific State or National standards exist for mercury in sediments; however, mercury concentrations in sediments in Resurrection Creek side sloughs were similar to values found on other creeks in the Cook Inlet Basin, some pristine in character. Mercury concentrations from Resurrection Creek side slough sediments were all lower than NOAA's freshwater "threshold effects level" (TEL), the concentration "below which adverse effects [to aquatic organisms] are expected to occur only rarely." Results and analysis of the water and sediment sampling for mercury on Resurrection Creek are available online at:
http://www.fs.fed.us/r10/chugach/pdf/res_creek_pdf/Mercury_in_fish_Res.pdf

Resurrection Creek, both within and downstream from the project area, serves minimally and only occasionally as a drinking water source. Resurrection Creek streamflows move quickly downstream into the marine waters of Turnagain Arm, where the water is rapidly mixed and diluted into this large water body.

Sport fishing opportunities exist for salmon, but because salmon spend most of their lives in the ocean, they have limited exposure to any mercury in this system. Coho juveniles sampled during the evaluation contained extremely low levels of mercury (0.04 ppm). The amount of mercury found in fish were also well below the toxicity level that would be lethal to fertilized eggs and developing fish

*Other Heavy Metals:* The Forest Service tested heavy and trace metals within the watershed on three occasions during 1980. Measurements were taken upstream, within, and downstream of active mining sites. Measurements upstream of mining sites are considered as reference levels while those within and downstream are considered to be current levels for this analysis.

The small sample size of this study limits conclusions on the effect of mining upon concentrations of heavy and trace metals.

Concentrations in excess of state water quality levels were measured on five occasions within the watershed association. Manganese concentrations exceeded standards within wash water on Resurrection and Palmer Creeks. Lead concentrations surpassed standards within wash water and downstream of mining on Resurrection Creek. Lead levels violating state standards were also measured in Palmer Creek above mining but not below the mining site.

Three water quality samples collected in 1994, one each taken upstream, within, and downstream of placer mined reaches of Resurrection Creek indicated no presence of arsenic, copper, lead, or zinc above detection levels.

Two water quality samples collected in 1994, one upstream and one downstream of placer mined reaches of Bear Creek (outside but adjacent to the Resurrection Creek watershed) indicated a slight increase (.0011 mg/L) of arsenic with a concentration of 0.0066 mg/L at the downstream sample site. Changes in concentrations of copper, lead, and zinc were not found within the sampling detection limits.

### Riparian Areas and Wetlands

Less than 30% of the project area's riparian areas (areas within 300 feet of the wetted channel) are stocked with coniferous stands. The rest (>70%) are stocked with early seral hardwoods such as black cottonwood. This, combined with low in-stream large woody debris levels, creates a situation where the stream has a very little potential for habitat diversity in the long-term (>50 years).

National Wetland Inventory (NWI) maps show the Resurrection Creek Watershed with about 2.5% wetlands.

Wetlands within the Resurrection Creek watershed concentrate along stream channels (riverine, ~ 25 acres) and within forested areas generally lower on hillslopes, where springs and groundwater saturation persist (palustrine-forested, ~2400 acres). These latter wetlands are often small in size and difficult to identify from aerial photography. They are likely underrepresented on the NWI maps of the watershed. Estuarine wetlands are prevalent at the mouth of Resurrection Creek (~ 25 acres).

### Groundwater

*Springs and Wells*

Most homes in Hope use wells for their water source. Perhaps 100 wells exist.

Numerous springs are found throughout the watershed, most commonly along lower portions of the valley side-slope, below long, slopes. Groundwater on the sideslopes trickles through the soils layer and the fractured bedrock below, and "daylights" lower on the slopes.

*Aquifer*

The greywacke and shale bedrock is not porous enough to create significant aquifers.

Alluvial gravels within the bottom of Resurrection Creek Valley are porous and can contain a sizable aquifer. Most wells in Hope tap into this aquifer.

### *Environmental Consequences*

The Resurrection Creek Stream and Riparian Restoration Project proposes to return a mining impacted reach of Resurrection Creek to a channel form and function matching similar, un-mined upstream reference reaches on the creek. The project would restore high quality aquatic habitat on the creek, and restore floodplain function, vegetation, and habitat. The long-term effects on fish and wildlife habitat are overwhelmingly beneficial. Channel function, water quality, and flood abatement all would improve as a result of the project.

Comparison of alternatives in terms of hydrology and aquatic resources will be based on the following parameters:

- Heavy Metals
- Water Quality / Sediment / Turbidity
- Spawning Habitat
- Large Woody Debris
- Flood Prone Entrenchment
- Off-Channel Habitat
- Pool Frequency and Quality
- Recreation

### Alternative 1: No action

*Direct and Indirect Effects*

### Channel Processes

Under the no action alternative, the recovery of stream channel morphology and pre-disturbance characteristics would be the result of natural processes. Since the stream channel has remained in a degraded state for over one hundred years it is unlikely that natural recovery will occur in the short-term less than 50 years. With the exception of a stochastic geologic or extreme hydraulic event, the stream channel, riparian vegetation, fish and wildlife habitat would continue to limit and negatively impact fish production. The mine tailings will continue to confine the stream restricting flood prone width ratios to 1:1. Due to the confinement and resulting increase stream channel slope, pools, side channels, over-wintering and spawning habitat for fish will continue to be extremely limited within the project reach. Mine tailings that are composed of coarse substrate occupy approximately 50% of the historic floodplain. This coarse substrate is unable to support the historic riparian vegetation composition and stand structure.

The mine tailings prevent flood flows and the fine sediment they deliver from being transported to the floodplain. Therefore riparian vegetation will be perpetually sparse within the reach. Channel complexity will remain low and will likely not support similar quantities of past populations of fish species at pre-mining population levels. Under this alternative, riparian dependent processes

(habitat complexity, future sources of LWD and channel stability) would not improve in the foreseeable future.

No decreases in flood peaks or sediment loads would occur. Channel gradient or stream substrate size, and high critical shear within the channel during flood events would remain unchanged.

This alternative would not construct new bridges, roads, trails or parking areas or disturb existing tailings piles, tree stands, or soil sources. No short-term turbidity pulses would be caused by channel construction/connection, and no sediments related to new construction would affect water quality on Resurrection Creek.

Whatever elemental mercury is present within the project area would continue to reside in place. Some portion of resident elemental mercury would likely convert over time to the more toxic methylmercury. This methylmercury would become slowly available for uptake by plants and aquatic organisms.

Recreational suction dredging and gold panning would continue to be allowed on Resurrection Creek for the half-mile downstream (north) and the mile upstream (south) from the Haun Trust lands. Recreational gold panning-related stream sedimentation and (illegal) bank disturbance would likely continue. Bank disturbance has the effect of widening the creek, reducing the viability of streamside riparian vegetation, and reducing the amount of wood in the stream. These actions reduce instream habitat quality for fish.

No project-related changes in fish or wildlife populations would occur, or project related increases in bank fishing.

Existing flooding problems occurring on Haun Trust Lands would continue. No project-related remediation of this problem would occur.

### Riparian Forest Recovery

The indirect negative effects stemming from poor riparian conditions would indirectly limit productivity within the project reach for the foreseeable future.

### Large Woody Debris

The lack of large woody debris (LWD) within the project reach will continue to inhibit juvenile salmonid rearing habitat, suitable spawning sites, and habitat diversity. Under this alternative, large woody debris would potentially decrease. This is because contributions of LWD from both the planning area and upstream are minor, and because high flows would continue to flush existing LWD from the project area. For LWD accumulations to reach historic levels (~300 pieces per river mile) would likely take centuries. The lack of in-stream LWD would continue to directly negatively affect riparian, channel and fish habitat conditions for the foreseeable future. This would impede the recovery of suitable chinook, coho, pink, chum and Dolly Varden habitat and continue to limit their production within the project area.

### Off Channel Fish Habitat

Recent restoration work has reconnected a fraction of the historic salmonid off channel rearing habitat but the vast network of side channels has been either buried by the tailings or cutoff from the main channel. Under the no action alternative these conditions would persist indefinitely.

### Pool Frequency and Quality

The lack of pools within the project area limits resting and rearing habitat for juvenile and adult salmonids. Under this alternative, no improvement to pool quantity or quality is anticipated. The poor pool quality of the project reach would continue to have direct and indirect negative effects on the production of both adult and juvenile salmon and char.

### Cumulative Effects

Cumulative effects are described as the impacts on the environment that result from the incremental impact of the action added to other past, present, and reasonably foreseeable actions, regardless of the agency or person undertaking the action. The detrimental effects from no action would be more correctly termed as indirect effects of the lack of recovery from past degrading actions rather than cumulative effects from no action.

The proposed project area is a portion of approximately five miles of Resurrection Creek's channel that have been highly disturbed by historic placer mining activities. By not improving channel conditions in this alternative, the project area continues to act cumulatively with the other disturbed channel reaches in maintaining degraded channel conditions and degraded stream and riparian habitat for fish and wildlife. These disturbed channel segments are all within the lower seven miles of Resurrection Creek and likely provided the system's highest quality fisheries and riparian habitat before mining disturbance. Anecdotal reports from early miners mention abundant runs of king salmon in Resurrection Creek.

### Summary of Effects of Alternative 1

Under this alternative no federal or private funds would be expended. This alternative is not consistent with the Forest Service's goal to maintain or restore water quality to provide for stable and productive riparian and aquatic ecosystems, stream channel integrity, or to promote the recovery of aquatic vegetation. Levels of heavy metals including mercury would remain at existing levels. Future mining within the watershed could further degrade riparian and habitat conditions. The Alaska Department of Natural resources standards and guidelines for mining activities within anadromous waters would limit the impacts. This alternative would not address the project goals and objectives in the short or long or term.

## Alternative 2

*Direct and Indirect Effects to Aquatic Resources*

Alternative 2 would restore 0.9 miles of stream channel on Resurrection Creek and its adjacent floodplain on National Forest lands and 0.2 miles of stream channel on the Haun Trust (private) lands. This alternative would increase Resurrection Creek's channel length by 800 to 900 feet and increase channel sinuosity and the number of main channel pools. It would greatly increase the number and length of side channels, and the volume of large and small wood within the both the main and side channels.

### Heavy Metals

Despite the relatively low concentrations of mercury found in scuplin, coho, water and stream sediment within the project reach, localized deposits of mercury could exist within the tailings piles or at a depth below the bed surface. Elemental mercury (if present) within the Project Area would largely continue to reside in place under this alternative. Some elemental mercury may be disturbed and redistributed during construction. Such redistribution would do little to change existing methyl mercury concentrations in the water or stream sediment. If an accidental release of elemental mercury did occur, it is very unlikely to be carried downstream. Resurrection Creek is not used as a domestic or municipal water source and casual human consumptive uses are very limited. Forest Service personnel would be present on the ground during all ground disturbing activities, and would be trained and prepared for mercury clean-up. If any pools of elemental mercury were found during construction, they would be removed from the site in order to reduce the available mercury within the project area.

Recreation gold panning would be restricted to the reach below the project area. which would help to prevent damage to riparian vegetation recovery. Restricting recreational gold panning below the project area would also prevent displacement of restored spawning gravel.

### Water Quality / Sediment / Turbidity

Project construction under this Alternative would likely cause some short-term increases in sedimentation to Resurrection Creek. Short-term plumes of fine-grained sediment released into Resurrection Creek during channel diversion probably create the greatest water quality concerns. The first diversion would come when both Resurrection and Palmer Creeks are initially moved into a west side channel so that the majority of the construction of the new, restored channel could be done "in the dry". Sediment plumes would again occur when Resurrection and Palmer Creeks are diverted back into the newly constructed channel segments. About six to eight individual diversions would be required.

When water is diverted, and as new channel segments are first connected to the flows of main stem Resurrection Creek, suspended sediment and turbidity is likely to increase considerably within the channel for approximately one mile

downstream for a limited time period. Based on water quality monitoring conducted during a similar restoration project (Hatchery Reach Water Quality Monitoring, 1997), short-term turbidity increases exceeding the State of Alaska's water quality standards (no more than 5 NTUs above ambient conditions) are expected. The duration of turbidity would be short-lived; approximately one hour after stream channel disturbance. (Hatchery Reach Water Quality Monitoring, 1997). Turbidity plumes created during channel connections on previous projects within Resurrection Creek also lasted up to 10 minutes before returning to ambient conditions (personnel communication with Blanchet, 2003). All diversions would take place during ADNR's instream construction window from May 15 and July 15. The Forest Service would consult with Alaska Department of Environmental Conservation to define the best practices for limiting turbidity exceedences related to the channel diversions.

Turbidity levels are expected to substantially dissipate downstream with fine silt and clay particles remaining in suspension for approximately one mile. The greatest increase in turbidity would occur during the construction of the water diversion into the western channel. Once water is diverted, the majority of the construction work would occur in the dry. The project is expected to take approximately two years to complete due to the complexity of the project. The total duration of in-channel work is expected to last approximately 30-40 days per water year. As the project nears completion water would be reintroduced into the newly constructed segments and turbidity increases would again exceed 5 NTU's. This alternative is projected to generate six to eight high turbidity events over a two-year period are expected to be generated as a result of this alternative. The diversion would allow the majority of channel and floodplain construction activities to be conducted out of flowing water. For instance, construction of restored stream segments would begin on the west side of the tailings piles, isolated from Resurrection Creek. This phase would be conducted in May-June. After new channel segments are completed, a bulldozer and excavator would be used to construct "push-up" dams. These dams would use native substrates to divert water into the newly constructed channels.

Under Alternative 2 additional incidental increases in turbidity could be generated from construction activities including: bridge construction, road and trail construction, timber harvesting and skidding, tailings removal and placement, sorting of tailings deposits by substrate size, new channel development, soil removal and placement, and campground/parking area development.

Temporary bridge construction over both Palmer and Resurrection Creeks in Alternative 2 would also be of concern for short-term releases of sediment into the creeks. Construction of bridge abutments and piers would be the primary concern for stream sedimentation. Abutments would either be built entirely out of the creek, or using sediment curtains to prohibit sediment from getting into the stream. Depending on the final design selected, the bridge over Resurrection Creek could require a central pier within Resurrection Creek. Initiation of construction of a pier could also cause a short turbidity plume on Resurrection Creek. The Forest Service would again apply for a State Water Quality Variance. Bridge construction on Palmer and Resurrection Creeks would require several

heavy equipment (excavator) creek crossings for construction of the far-side bridge abutments. Such crossings will require approval from ADNR-Office of Habitat Management and Permitting.

The new segment (0.35 miles) of road to Palmer Creek would replace a road segment currently exposed to flooding and erosion by Resurrection Creek. This existing segment would become part of the new Resurrection Creek floodplain, and the new road segments should have a greatly reduced effect on sedimentation to the creek. The new Resurrection Pass Trail construction through Haun Trust lands would replace existing trail obliterated during the floodplain construction.

*Aquatic Species*: Direct mortality of fishes might occur during the implementation of action alternatives. Direct mortality could occur as a result of heavy equipment crossing the stream, excavation of streambed, and push up dam construction. The turbidity generating phases of the project would be implemented during mid June through July to minimize the impacts to fish populations. Pink, chum, coho and chinook salmon, resident Dolly Varden char, mountain whitefish and sculpin are all outside of their susceptible early life stages (egg to fry) during this period.

Indirect fish mortality could also occur as a result of increased turbidity. High turbidities have been shown to cause gill abrasion and reduce the feeding ability of salmonids. Such turbidities could indirectly kill juvenile coho and chinook salmon, resident Dolly Varden char and sculpin within and downstream of the project area (Lloyd, et al., 1987) (Sigler, 1980; Sigler et al., 1984). However, many studies have shown that fish can tolerate sediment exposure for short periods (McLeay et al., 1983); but when duration is considered as well as concentration, a duration time exposure limit appears to apply to most fish (Newcombe and MacDonald, 1991).

Adverse effects to fish would be short-term and would occur during construction. The impact to the overall populations is expected to be very small and limited to resident fish and two cohorts of anadromous fish within and potentially one mile downstream of the project reach. The in-stream implementation phases of this project would occur after the fry and smolt have emigrated. The diversion would allow adult pink, chinook, and coho salmon to immigrate through the project area unimpeded and spawn up-stream. During implementation (4-5 weeks), de-watered sites would be electro-shocked after push up dam construction to remove fish stranded behind the impoundment. The majority of fish would be removed from the dewatered stream segments to portions of the stream not affected by construction. Direct impacts within the project reach would be limited to age 0 and 1+ chinook salmon and coho salmon, resident Dolly Varden and sculpin.

Direct and indirect mortality of fish are not expected to occur as a result of bridge, trail or road construction. In the long-term, project would result in small decreases in downstream flood peaks and flood-related sediment loads as an indirect result of increased floodplain area.

Using ADNR's timing window means that Resurrection Creek salmon fry will have emerged from stream gravels before the any stream diversion are initiated. Accordingly the previous winter's eggs would not be threatened by losses due to sedimentation of the spawning gravels. Additionally, during the construction window, streamflows generally reach their annual (snowmelt generated) peak. Stream velocities are at their annual maximum, and fine-grained sediments that can deposit in salmon redds (nests) are much more likely to stay in suspension. Natural turbidity is elevated during this time period as the higher flows of Resurrection Creek and its tributaries scour sediments from their beds and banks. At its mouth, Resurrection Creek enters marine waters, and mixes with the highly turbid waters of Turnagain Arm.

Direct mortality of aquatic macroinvertebrates within the project area would be expected. This impact would be brief (12 hours) after disturbance and will be limited to the restored reaches and approximately 1 mile downstream. Based on research by Novotny and Faler (1982), re-colonization of aquatic invertebrates from upriver reaches could occur rapidly due to species dispersal from in river drift. Gersich and Brusven (1981) estimated that full aquatic insect colonization of rock substrates within disturbed areas would take 47 days.

### Flooding problems on the Haun Trust lands

Construction of the restoration project would widen the floodplain upstream from the Haun Trust lands. The widened floodplain would reduce the high water level for any given flood. The widened floodplain would also retain some of the floodwaters so as to slightly diminish the height and extend the length of the flood peak. These actions would reduce flooding problems on the Haun Trust Lands rather than increasing them. However, due to the elevation of the Haun Trust Lands relative to the floodplain elevation, flooding problems could continue to occur on these lands even with the project-related reductions in flood peak size.

Flooding problems on the Haun Trust lands could be further decreased by floodplain contouring on National Forest lands on the east side of Resurrection Creek immediately south of the Haun Trust lands. The most effective means of eliminating the flooding problems on Haun Trust Lands, however, would be to: 1) increase the bank height where flood flows are spilling over the diversion structure built in 1980, and 2) increasing the floodplain width both at and immediately downstream from the diversion structure. Either of these two measures could be implemented quite easily using project related construction equipment. Implementation of either of the measures would require concurrence from the landowners.

This alternative would have the effect of slightly reducing the water level of any given Resurrection Creek flood event as the creek enters Haun Trust Lands. This would reduce by a small amount the flooding problems currently occurring on these lands. Flooding problems on the Haun Trust lands would be further decreased by: 1) floodplain contouring on National Forest lands on the east side of Resurrection Creek immediately south of the Haun Trust lands, and 2) increasing floodplain width on Haun Trust lands through proposed restoration

measures on the land. Flooding problems on the Haun Trust lands could be virtually eliminated by increasing the low streambank height where floods spill onto these lands. Such a measure would require concurrence from the landowners.

### Spawning Habitat

Alternative 2 proposes to sort gravel from tailings piles and then place appropriately-sized substrates in the newly constructed channel to "jump start" or augment spawning gravel. As a direct result of the implementation of this project, spawning gravel is estimated to increase from 160yd² to approximately 2,000yd². It is estimated that <5% of all fish spawn within the project reach. The increase in available spawning gravel would dramatically increase chinook, coho, pink and potentially chum salmon utilization and production within the project reach. Additionally, Dolly Varden and scuplin would benefit from the increase in prey base.

### Large Woody Debris (LWD)

Approximately 3,500 whole trees would be extracted (approximately ½ with roots attached), hauled to the project area and stockpiled at designated locations along the project reach. During channel construction, approximately 500 trees would be incorporated into in-stream structures, and the remainder distributed throughout the reclaimed floodplain and reconstructed channel segments. Large in-stream woody debris (>12" in diameter, >60' in length) would be increased from 13 pieces/river mile to ~500 pieces/river mile.

The addition of LWD would dramatically increase channel complexity, protect riparian conifers, increase pool quality and retain nutrients. Benefits to adult and juvenile salmonids from the addition of LWD include the addition of cover, increased pool depths and retention of carcasses and other organics. Salmon carcasses can contribute anywhere between 20-30% of the available nitrogen and phosphorus in a particular stream system (Bilby, 1993). The marine-derived nutrients associated with salmon carcass decomposition are 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 LWD and the increased retention of these nutrients would indirectly affect all ecosystem aspects, ranging from stream micro-organisms and benthic macroinvertebrates, to top level predators such as eagles and bear.

Implementation of this alternative would in the short and long-term indirectly benefit both juvenile and adult salmonids by creating large lateral pools for rearing and resting during migrations and over-wintering. Monitoring in the "Mining Reach" of the Wind River in Washington State documented increases in bank full pool volume within a half-mile reach by 520% (from 490yd³ to 3,140yd³) (USDA Forest Service, 2000).

In the long-term, salmonids would also benefit from restored and self-maintained levels of channel complexity. LWD would also provide roughness elements that

would help regulate bed load movement of the stream channel and fine sediment deposition on the flood plain through time. Log complexes would also assist in the regulation of water velocity and volume within side channels.

## Watershed Morphology

*Flood prone Entrenchment*

Action Alternatives 2 through 6 would increase the floodprone width to stream channel width ratio, and would reduce stream gradient (slope) by increasing the length of the channel. Off channel ponds and side channels will also be constructed throughout the floodplain. The new channel and floodplain complex will be designed to allow streamflows to overflow the main channel onto the floodplain at flood events > 1.5-year return intervals.

Flood plain inundation will help to reduce the size of the flood peak by temporarily storing water on the floodplain. Increasing channel sinuosity and reducing the flow volume in the main channel during flooding would result in slower stream flows and lower shear on the bed and banks of the stream. This would allow for greatly improved retention of spawning gravels and large and small wood within in the main channel. Increasing the channel length would allow spawning gravel to be retained, which will directly benefit all fish within the project reach. Reduced flow velocities and channel shear would reduce erosion of sediments from the bed and banks of the stream.

Project-related reductions in flood sediment transport and flood peaks would likely be relatively modest. This is because the newly created floodplain would add on to several miles of existing healthy and functioning floodplain located upstream from the project area.

The completed project would result in small decreases in downstream flood peaks and flood-related sediment loads as a result of increased floodplain area.

*Off-Channel Habitat*

Reconstruction of the stream channel would increase the main channel habitat for fish by approximately 650 feet. Reconnecting the floodplain to the new off channel ponds would increase high flow refugia and off channel habitat by approximately 20% or 23,000 $yd^2$ of side channels and off-channel rearing ponds. The increase in off channel rearing habitat will primarily benefit coho salmon. Other species such as Dolly Varden and chinook would also benefit directly and indirectly from the increase in off-channel habitat but to a lesser extent.

*Pool Frequency and Quality*

Channel reconstruction will also result in direct increases in pools within the project reach. Residual pools with depths greater than three feet deep are expected to increase from three pools to 22 pools within the project reach. The increase in primary pools would directly and indirectly benefit all species and life stages of fish by providing low water velocity resting habitat, and bubble curtains and depths that provide hiding cover from predators. In addition, the increase in

pool habitat will indirectly increase foraging efficiency for juvenile and resident life stages of fish.

## Recreation

### *Angling Pressure*

Public scoping raised a concern that the improved habitat created by the proposed project would elevate returning salmon numbers sufficiently to increase fishing use of Resurrection Creek. Habitat improvement for this project intends to improve both spawning and rearing habitat for salmon. Wenger (1991-3) found a number of factors indicating that Resurrection Creek was rearing-limited for chinook and coho salmon. Resurrection Creek currently has a robust pink salmon population, and pink salmon require limited instream rearing habitat (after emergence, the fry migrate quickly into marine waters.)

Project related habitat improvements are most likely to benefit chinook and coho salmon populations, with some probable increases in pink salmon spawning as well. Chinook escapements on Resurrection Creek are currently around 100-500 adults, with adults entering the stream in July and early August. ADF&G maintains a closure on chinook fishing in Resurrection Creek due to the small population size. The proposed restoration project is intended to create habitat similar to un-mined reaches of Resurrection Creek. Modest gains in the total chinook salmon escapement are expected, and those gains should increase over time as the riparian vegetation matures in the restored reach, and instream levels of large wood stabilize.

The adult coho salmon return to Resurrection Creek in a late run, with the adult spawners generally entering the stream in late August through October. ADF&G estimates that several hundred coho adults return to Resurrection Creek. Although Resurrection Creek has an open coho fishery, limited fishing occurs due to the small size of the fishery, and the lateness of the season. With lower water levels at this time of year, bank anglers often use unvegetated point bars on the creek, reducing angler impacts to streamside vegetation. Increases in total returning adult coho spawners to Resurrection Creek as a result of project-related habitat improvements are expected to be moderate. Increases in coho sportfishing on Resurrection Creek would likely be small, as would increases in fishing-related damage to streamside vegetation.

Resurrection Creek has a well-established pink salmon run with an estimated 20,000 to 35,000 returning adults on even-numbered years. This pink salmon run attracts anglers to Resurrection Creek in early August, particularly to the mouth of the stream in downtown Hope. This fishing attraction has grown moderately over time as anglers have found out about this fishery, and local businesses in Hope have promoted it. Improved spawning habitat created on Resurrection Creek by the proposed stream restoration project would result in a small total increase in the pink salmon run on Resurrection Creek, and possibly a small increase in the number of anglers using the creek.

The increase in pools and the fish congregating within the project area would potentially indirectly increase angling pressure from both humans and bears. Sport catch and harvest of Resurrection Creek salmonids was estimated from the Statewide Harvest Survey, (AFG 1996-1999). On average 2,500 angler days were estimated for Resurrection Creek over the three-year period. A fairly large percentage of those days were concentrated near the mouth of Resurrection Creek for the pink salmon fishery. Restoration of the project area and the close proximity of the Resurrection Pass Trail would potentially make the area more attractive to fishing and could potentially shift some pressure up stream.

Resurrection Creek is currently closed to the popular chinook or king fishery which receives the greatest pressure on the Kenai Peninsula. The project, however, is unlikely to increase adult chinook escapements to the point of opening the stream to chinook fishing. Such a decision could only be made after population evaluation and consideration by ADF&G-Sport fish Division.

Even if Resurrection Creek were open to chinook fishing the project is not expected to increase chinook populations to a point where large numbers of anglers would target the system. The large amounts of wood to be incorporated into the perimeter of the pools would create obstacles for anglers and cover for fish. These factors would likely reduce catch efficiency of humans. The large amounts of wood placed on the floodplain will also restrict angler access and protect revegetation efforts from bank trampling.

Small increases in bank fishing may occur on Resurrection Creek as a result of implementing Alternative 2. Such increases in bank fishing could possibly result in localized increases in trampling of streambank vegetation, and possible increases in degradation of spawning and rearing habitat. To date, angler-related streambank degradation on Resurrection Creek has not been identified as an important threat to fish spawning and rearing habitat.

*Recreational Gold Panning*

As in Alternative 1 (no action) recreational suction dredging and gold panning would continue to be allowed on the half-mile of Resurrection Creek downstream (north) of the Haun Trust lands and upstream from the Resurrection Pass Trail bridge. Mining-related stream sedimentation and bank disturbance would continue in this stream segment. The one-mile section of Resurrection Creek upstream (south) from the Haun Trust lands would be closed to recreational gold panning. This closure would be implemented in order to facilitate the long-term restoration goals on this stream segment.

During project related stream diversions, recreational suction dredgers could be briefly impacted by the reduced water clarity associated with turbidity plumes.

*Interpretation*

Alternative 2 also proposes to install interpretive signs along the Resurrection Pass trail adjacent to the project area, along with an interpretive program in a mining cabin at the new parking area. The interpretation will help inform and educate the public on the objectives of the project and will help to reduce impacts to recovering riparian vegetation and the restored fish and wildlife habitat.

### Cumulative Effects

Alternative 2 would have a long-term benefit to channel function, aquatic and riparian habitat, and reductions in turbidity and flooding. Adverse effects to water quality would be primarily short-term and would occur during construction. Little activity is currently occurring or proposed in the Resurrection Creek Watershed that would work to further, cumulatively impact water quality on Resurrection or Palmer Creeks. The Palmer Creek Road is the only road within the watershed upstream from the project area. This road and the Resurrection Pass Trail have been in place nearly 100 years, and surface erosion from the road and trail are known to be limited.

Some mechanical treatment of beetle-killed spruce adjacent to the Palmer Creek Road may occur simultaneously to the proposed channel construction activities in Alternative 2. Such mechanical treatment would occur well over a quarter mile from Resurrection or Palmer Creek. Such treatments have shown to produce very limited surface disturbance or erosion, and would not be expected to create additional stream sedimentation in Resurrection or Palmer Creeks.

Currently there are few projects or activities occurring within the Resurrection Creek Watershed that would cumulatively impact the water or aquatic resources. Commercial and recreation mining on Resurrection Creek are small scale and limited. State mining regulations limit the amount of mining related sediments that may enter the creek. Combined effects of stream sedimentation from both the proposed project and mining activities on Palmer and Resurrection Creeks are unlikely to exceed State Water Quality Standards except during diversion-related turbidity plumes (Water Resources Report, Blanchet, 2004).

### Summary of Effects of Alternative 2

The long-term indirect and cumulative effects of implementing this project would be the restoration of riparian vegetation, increased spawning substrate, pools and perennial side channel flows and associated over-wintering habitat, which would improve aquatic habitat quantity and quality, fish populations and aquatic invertebrates. Aquatic vertebrate and invertebrate populations are expected to respond positively to the stream channel and riparian rehabilitation. Increased spawning and rearing habitat created by the action alternatives are expected to provide a long-term, net positive benefit to the project reach, the aquatic ecosystem, and fisheries resources for the foreseeable future.

### Alternative 3

**The differences between Alternative 3 and Alternative 2 are:**

1) Mine tailing and Stream Channel Rehabilitation would occur on public lands only (on the 0.9 mile segment of Resurrection Creek immediately upstream from the Haun Trust Lands.)

2) During construction, Resurrection Creek stream flows would be moved into a diversion channel that joins with lower Palmer Creek. This diversion differs from the west side channel for Resurrection Creek in Alternative 2.

3) Recreation Mining would be permitted on river mile 4.7 – 5.6 (the project reach), one quarter mile of lower Palmer Creek and downstream of the Haun Trust Lands.

4) Approximately 0.7 miles of road would be constructed around the outside of the east boundary of the Haun Trust Lands. This road would be built on valley side slopes ranging from 0 to 40% in slope.

5) The existing Resurrection Pass Trailhead would be enlarged and rebuilt.

6) The existing dispersed camping area would be relocated to a new parking and camping area created from tailings waste.

*Direct and Indirect Effects*

Restoration would occur on public lands only (river mile 4.8 – 5.8). Two-tenths of a river mile on the Haun Trust Lands would not be restored slightly reducing the restored floodplain area, pieces of large woody debris, area of spawning gravel and pools from Alternative 2. The benefits to salmon and char would also be slightly reduced.

### Heavy Metals

Leaving Resurrection Creek open to recreational gold panning through the restored stream reach would allow for a greater possibility for multiple instream excavations down to the shallow clay layer where elemental mercury is most likely to reside. This would allow for a greater probability of redistributing the mercury, and in some cases possibly removing it from the stream. Redistribution of the mercury has limited additional toxic hazards to those already posed by resident mercury unless: 1) elemental mercury is being moved to a location where it is more likely to methylate (unlikely) or 2) if the recreational miners are importing new mercury to the site for processing their black sands, and spilling some of this mercury to the environment.

Mercury issues related to channel construction under Alternative 3 would be incrementally less than Alternative 2. Alternative 3 does not include channel restoration or the associated construction disturbance on the Haun Trust lands. Excavation and/or redistribution of potential existing mercury spills would not occur on the Haun Trust lands under this alternative as it possibly might in Alternative 2.

Mercury issues related to the fisheries resource would be increased by the permitting of recreational gold panning within the project area. There would be a greater probability of disturbing and in some cases possibly redistributing mercury in Alternative 3 than in Alternative 2. Redistribution of the mercury could

expose elemental mercury to a location where it could contaminate incubating eggs.

### Water Quality / Sediment / Turbidity

From the standpoint of stream sedimentation, the largest differences between Alternative 3 and Alternative 2 include: 1) no stream channel restoration work on the Haun Trust lands, 2) Construction of 0.7 miles of new Forest Service road around the outside of the east boundary of the Haun Trust lands, 3) Recreational gold panning is open on one mile of Resurrection Creek south of the Haun Trust lands and a quarter mile of lower Palmer Creek and 4) Diversion of the stream will occur on the Eastern channel.

*No Stream Restoration on Haun Trust lands*

Eliminating restoration work on this 0.2-mile segment of Resurrection Creek also eliminates the long-term benefits of reduced bank erosion and improved habitat on the segment. No temporary flow diversions or turbidity releases related to channel and floodplain construction would occur on Haun Trust lands in Alternative 3.

*New Access Road*

The road route around the east side of the Haun Trust lands has some possibility to transport sediments to Resurrection Creek. None of the small cross drainages along the road route has perennial flow. Eroded road sediment carried into these ephemeral drainages during runoff periods would, for the most part, not be transported as far as Resurrection Creek. Limited potential for mass wasting (landsliding) along the road route exists. This potential can be greatly reduced by designing and constructing the road to limit the time and concentration of rainfall and snowmelt runoff on the road surface.

*Recreational Gold Panning*

By leaving Resurrection and Palmer Creeks open to recreational gold panning within the 0.9-mile restoration area, the possibility of a considerable amount of mining-related stream channel disturbance could occur on the newly restored channels. At present recreational suction dredging use in this stream segment is low, presumably due to lack of road access.

Regulations for recreational gold panning limit the mining activities to the “active channel (the un-vegetated streambed.) Restoration activities on Resurrection and Palmer Creeks would not only increase the lengths of the main channels, but would greatly increase the number and length of side sloughs to the creek. By regulation, these high habitat value side sloughs would be open to recreational gold panning. The net result of Alternative 3 would be to more than double the length of channel that could be mined in the 0.9-mile long restoration reach. The long-term effect of increased turbidity could potentially negatively affect fish.

*Resurrection Pass Trail North Trailhead Expansion*

Trailhead parking area construction would be on flat ground with a vegetated buffer between the parking area and Resurrection Creek. The area is underlain

by well-drained mining tailings. The proposed parking expansion extends onto un-vegetated mine tailings. The parking area should be graded and sloped away from Resurrection Creek. Sediment transport to Resurrection Creek from the increased parking area would be negligible.

*East- Side Diversion*

During construction, Resurrection Creek stream flow would be diverted into the Palmer Creek channel and maintained in this eastern channel, as opposed to the west side alignment in Alternative 2. The disadvantage of this diversion strategy would be related to the amount of excavation and an increase in high turbidity events (6-8 in Alternative 2, 8-10 in Alternative 3). These additional two high turbidity events would be generated by the orientation of meander construction relative to the location of the diverted flow. The additional turbidity events would increase the risk of short-term negative impacts to fish relative to fine sediment previously discussed.

### Aquatic Species

Alternative 3 would create slightly less aquatic habitat than Alternative 2. However, by permitting recreational miners into the newly re-contoured project area could possibly increase the level of interest for prospecting and mining in this area. If suction dredging were to increase on the restored stream section, it could result in considerable damage to new aquatic habitat including:

•damage to the banks and bank vegetation of both the main channel and side sloughs,

•disturbance and downstream transport of instream wood

•physical disturbance and resorting of spawning gravels.

•disturbance and restructuring of instream pools

•direct increases in macro-invertebrate mortality, which would indirectly impact salmon and char by reducing available food.

### Watershed Morphology

Comparing the channel morphology in Alternatives 3 to Alternative 2, Alternative 3 has:

- An incremental decrease in restored channel.
- Increased adverse impacts to constructed off-channel rearing ponds and side sloughs by recreational mining.
- Increased restructuring and damage to constructed pools by recreational mining.

### Flood Concerns on Haun Trust Lands

This alternative would have the effect of slightly reducing the water level of any given Resurrection Creek flood event as the creek enters Haun Trust Lands. This would lower by a small amount the flooding problems on these lands. Flooding problems on the Haun Trust lands would be further decreased by floodplain contouring on National Forest lands on the east side of Resurrection Creek immediately south of the Haun Trust lands. Flooding problems on the Haun Trust lands could be virtually eliminated by increasing the low streambank height where flood flows spill onto these lands, and also by allowing flood flows to spill onto a currently inaccessible floodplain on the west side of Resurrection Creek at the south end of the lands. Such activities would require concurrence from the landowners.

### Recreation

The main differences between Alternatives 2 and 3 relative to recreation are the permitting of recreational gold panning within the rehabilitated reach under Alternative 3, and relocation of the dispersed recreation campsite currently located along Resurrection Creek. Bank angler issues related to the fisheries resource would be identical to those described under Alternative 2.

The relocation of the dispersed camping site adjacent to Resurrection Creek in Alternative 3 would reduce the risk of accidental petroleum spills from camper's vehicles and camping gear. This would reduce the potential for spill-related mortality offish and aquatic insects. In addition, rehabilitation of the site will allow riparian vegetation to recover and would increase bank stability and provide the stream with a source of large woody debris in the long-term.

### Cumulative Effects

This alternative combined with past, present and future activities within the watershed are not expected to cause long-term detrimental impacts to water/aquatic resources or existing fisheries.

### Summary of Effects of Alternative 3

Alternative 3 includes 0.2 miles less channel restoration work than Alternative 2 and therefore has less up-front water quality disturbances. The cumulative long-term benefits of aquatic habitat rehabilitation and fish production would be reduced by recreational gold panning disturbances.

### Alternative 4

Alternative 4 is very similar to Alternative 2. The differences between the two alternatives are:

1) Mine tailing and Stream Channel Rehabilitation would occur on public lands only on the 0.9 mile segment of Resurrection Creek immediately upstream from the Haun Trust Lands.)

2) Alternative 4 builds two bridges over Resurrection Creek. These two bridges are located just upstream and just downstream of the Haun Trust lands.

3) Alternative 4 uses 0.4 miles of the Resurrection Pass Trail through and immediately upstream and downstream of the Haun Trust lands as a road for construction equipment and crews. Where the trail is used for a road, a new temporary trail route would be built adjacent to the road.

*Direct and Indirect Effects*

### Heavy Metals

Mercury issues under Alternative 4 are quite similar to Alternative 2. The main difference is that Alternative 4 includes no channel restoration and its associated construction disturbance on the Haun Trust lands. Excavation and/or redistribution of potential existing mercury spills would not occur on the Haun Trust lands under this alternative.

### Sediment / Turbidity

Differences between Alternatives 4 and 2 related to water quality include:

*No Stream Restoration on Haun Trust lands*

By not doing restoration work on this 0.2-mile segment of Resurrection Creek, no long-term benefits would be realized from reduced bank erosion and improved habitat though this segment. No flow diversions would occur on Haun Trust lands. Alternative 4 would emit one or two fewer short-term turbidity plumes in Resurrection Creek than Alternative 2.

*Bridges*

Alternative 4 would build bridges over Resurrection Creek both upstream and downstream from the Haun Trust lands, and a bridge over Palmer Creek. Alternative 2 envisions the same bridge over Palmer Creek, and a single bridge over Resurrection Creek upstream (south) of its confluence with Palmer Creek. Construction and removal of bridge abutments and piers has the possibility of spilling sediment into the creek. The second bridge over Resurrection Creek in Alternative 4 adds an additional source of potential sedimentation over the bridges in Alternative 2. However, by using best management practices in construction and decommissioning of bridges, fine-grained sediments spilled into the creek can be kept to very low levels.

*Use of Resurrection Pass Trail for A Construction Road*

Alternative 4 would use 0.33 miles of the Resurrection Pass Trail (primarily through easement on the Haun Trust lands) as a road for project construction. It would build about 0.06 miles of new road from the lower bridge over Resurrection Creek to the Resurrection Pass Trail, and about 0.38 miles of temporary hiking trail to separate trail users from the construction road (see the Alternative 4 Map). Each one of these construction elements has the possibility of creating ground disturbance that could increase fine-grained sediment input into Resurrection Creek. These disturbances would be over and above those mentioned for Alternative 2.

The 0.33-mile section of the Resurrection Pass Trail proposed for use as a construction road has served as a road in the past, and should only require brushing and light blading to be put into use. This road segment is located primarily on top of well-drained tailings deposits. Surface erosion and sediment transport to Resurrection Creek from both the road and the new temporary trail would likely be low due to the high ground infiltration of runoff at the site. If surface erosion were found to be a problem during wet seasons, a filter fence could readily be constructed between the road and the creek to stop sediment transport.

### Aquatic Species and Watershed Morphology

All direct and indirect effects in Alternative 4 to the fisheries resource and channel morphology would be as described in Alternative 2 (except for the 0.2 miles of channel on the Haun Trust Lands that would not be restored.) This includes effects to spawning habitat, LWD, flood prone entrenchment, off-channel habitat and pools. Alternative 4 would have slight reductions in restored floodplain area, pieces of large woody debris, area of spawning gravel, and pools. Benefits to salmon and char would also be incrementally reduced.

### Recreation

*Angling Pressure and Recreational Miners*

Effects of recreational gold panning and bank anglers would be the same as those described under Alternative 2.

### Cumulative Effects

This alternative combined with past, present and future activities within the watershed are not expected to cause long-term detrimental impacts to aquatic resources or existing fisheries.

### Summary of Effects of Alternative 4

Alternative 4 includes 0.2 miles less channel restoration work than Alternative 2. The cumulative effects to fisheries only incrementally differ between the two alternatives. Alternative 4 has less up-front water quality disturbances than Alternative 2, as well as less long-term benefits to channel function and aquatic habitat.

## Alternative 5

*Direct and Indirect Effects*

Alternative 5 would restore the upper 0.6 miles of the Resurrection Creek stream channel on National Forest lands (Palmer Creek Alluvial Fan) and 0.2 miles of Resurrection Creek through the (private) Haun Trust lands. The notable differences between Alternatives 2 and 5 are:

1) Alternative 5 restores 0.6 miles of Resurrection Creek's channel on National Forest lands compared to 0.9 miles in Alternative 2.

2) Alternative 5 includes a bridge over Palmer Creek, but no bridges for construction access over Resurrection Creek.

3) Alternative 5 includes the Palmer Creek construction diversion, but no construction diversion for Resurrection Creek

Alternative 5 reduces the amount of stream channel restoration on National Forest lands by slightly more than a half of that in Alternatives 2, 3, and 4. Proposed channel restoration on the (private) Haun Trust lands remains the same as in Alternative 2.

### Heavy Metals

Mercury issues under Alternative 5 are similar to Alternative 2. The primary difference is that Alternative 5 would restore approximately 0.4 of a mile of stream on National Forest Land compared to 0.9 miles for Alternative 2. Under Alternative 5, excavation and/or redistribution of potential existing mercury spills would not occur on the lower 0.5 miles of Resurrection Creek on National Forest lands.

The effects of recreational gold panning and redistribution of mercury would be the same as those described under Alternative 2.

### Water Quality / Sediment / Turbidity

Short-term, construction-related impacts to water quality and fish in Alternative 5 would be nearly half of those in Alternative 2. Alternative 5 would create two to five turbidity plumes into Resurrection Creek as opposed to six to eight for Alternative 2. Alternative 5 requires neither diversion of Resurrection Creek nor construction of bridges over Resurrection Creek. Channel and floodplain restoration would require about half the number of trees and volume of soil needed in Alternative 2.

*Flood Concerns on Haun Trust Lands*

Evaluation and potential treatments are the same as those explained in Alternative 2. The (small to moderate) project-related reduction in flood stage explained in Alternative 2 would be smaller in Alternative 5. This is because less than half as much upstream floodplain would be opened in Alternative 5.

**Watershed Morphology**

*Spawning Habitat, LWD, Flood Prone Entrenchment, Off-Channel Habitat and Pools*

Although the short-term impacts to fish would be less under alternative 5, long-term benefits to spawning gravel, pools, side channel habitat and overall aquatic habitat diversity would be reduced by nearly half of those in Alternative 2.

**Recreation**

*Recreational Gold Panning*

Effects of recreational gold panning would be the same as those described under Alternative 2.

*Angling Pressure*

Under Alternative 5, impacts to streambanks relative to increased angling pressure would be substantially less than in Alternative 2. Angler access to restored sites would require crossing the main channel of Resurrection Creek which would limit fishing to those with chest waders. In addition, this alternative would decrease the production potential of salmon within the system leading to lower angler interest.

**Cumulative Effects**

This project combined with past, present and future activities within the watershed would not be expected to cause long-term detrimental impacts to aquatic resources or existing fisheries.

**Summary of Effects of Alternative 5**

Alternative 5 includes 0.5 miles less channel restoration work than Alternative 2. Alternative 5 would generate less turbidity and therefore less short-term impacts to fish than Alternative 2. Alternative 5 would also provide roughly half of the long-term benefits to aquatic habitat and fisheries.

**Alternative 6**

Effects to aquatic resources in Alternative 6 are very similar to Alternative 4. No channel restoration would occur through the (private) Haun Trust lands, the Resurrection Pass Trail would be used for access and two bridges would be constructed for equipment access. The main difference between the two alternatives is:

1) Restoration would not occur on Palmer Creek or the associated fan. Alternative 6 would restore the lower 0.5 miles of the Resurrection Creek stream channel on National Forest lands (as opposed to the full 0.9 miles in Alternative 4)

2) Alternative 6 does not include either the construction of a bridge over Palmer Creek or the construction diversion for Palmer Creek. Alternative 6 reduces the amount of stream channel restoration on National Forest lands by approximately 25% of that in Alternatives 2.

**Heavy Metals**

Mercury issues under Alternative 6 are similar to Alternative 4. The primary difference is that Alternative 6 undertakes 0.5 miles of stream restoration on National Forest Land compared to 0.9 miles for Alternative 4. Under Alternative 6, excavation and/or redistribution of potential existing mercury spills would not occur on the upper 0.35 miles of Resurrection Creek on National Forest land as might in Alternative 4.

**Water Quality / Sediment / Turbidity**

Short-term construction-related impacts to water quality in Alternative 6 would be nearly a half of those in Alternative 4. Alternative 6 would create two to four turbidity plumes into Resurrection Creek as opposed to six to eight for Alternative 4. Like Alternative 4, Alternative 6 would divert Resurrection Creek to a west-side channel during construction. Alternative 6 would require the same two bridges over Resurrection Creek as Alternative 4. Channel and floodplain restoration would require just over half the number of trees and volume of soil needed in Alternative 4.

Although the short-term impacts to water quality would be less under Alternative 6, long-term benefits to channel function, reduced flood impacts, and restored aquatic and riparian habitat would be reduced by about 40% of those in Alternative 4. Channel and floodplain restoration within Alternative 6 would require 800 to 1,000 trees less than Alternative 4.

Short-term impacts to water quality due to turbidity plumes would only be incrementally less under alternative 6 however long-term benefits to spawning habitat, pools, off channel rearing, and over all habitat diversity would be reduced by approximately 60% of those in Alternative 4.

*Flood Concerns on Haun Trust Lands*

Evaluation and potential treatments are the same as those explained in Alternative 3. The (small to moderate) project-related reduction in flood stage explained in Alternative 3 would be smaller in Alternative 6. This is because just over half as much upstream floodplain would be opened in Alternative 6.

### Watershed Morphology

*Spawning Habitat, LWD, Flood Prone Entrenchment, Off-Channel Habitat and Pools*

Although the short-term impacts to fish would be less under Alternative 6, long-term benefits to spawning gravel, pools, side channel habitat and overall aquatic habitat diversity would be reduced by nearly half of those in Alternative 4.

### Recreation

*Angler Pressure*

Effects of anglers would be almost identical to those described in Alternative 4. Increases in usable fish habitat in Alternative 6 would be nearly 2/3 of what would be produced in Alternative 4. However the majority of available holding water created in Alternative 6 would be readily accessible to bank anglers as described in Alternative 4. Alternative 4 describes a small potential streambank impacts related to increase bank fishing. However, the 1/3 decrease in production potential for salmon may also decrease angler interest.

*Recreational Gold Panning*

Effects of recreational gold panning would be the same as those described under Alternative 2 and 4.

### Cumulative Effects

This project combined with past, present and future activities within the watershed are not expected to cause long-term detrimental impacts to aquatic resources or existing fisheries.

### Summary of Effects of Alternative 6

Alternative 6 includes 0.4 miles less channel restoration work than Alternative 4. Alternative 6 would contribute less up-front water quality disturbances than Alternative 4, as well as providing less long-term benefits to channel function and aquatic habitat.

### Effects Determination for Essential Fish Habitat (EFH) – Resurrection Creek Channel and Riparian Rehabilitation Project

The Resurrection Creek basin is considered to be part of the Essential Fish Habitat for chinook, coho, pink and chum salmon. Because Resurrection Creek drains into the Turnagain Arm of Cook Inlet and salmon are part of the commercial catch along the Kenai Peninsula, EFH for these species extends up Resurrection Creek basin to long-standing natural barriers (RM 31). In the short-term (1-2 years) EFH will likely to be adversely affected (LAA) therefore consultation with NOAA Fisheries is ongoing. However, the long-term indirect and cumulative effects of implementing this project would be the restoration of riparian vegetation, increased spawning substrate, pools and perennial side channel flows and associated over-wintering habitat, which would improve

aquatic habitat quantity and quality, fish populations and aquatic invertebrates. Aquatic vertebrate and invertebrate populations are expected to respond positively to the stream channel and riparian rehabilitation. Increased spawning and rearing habitat created by the project are expected to provide a long-term, net positive benefit to the project reach, the aquatic ecosystem, and fisheries resources for the foreseeable future. The following table evaluates the effects by species.

**Table 4 Aquatic Species Risk Assessment**

| Species | Probability of Effect + | Consequence of Effect + | Cumulative Effect + | Determination of Effect * |
|---|---|---|---|---|
| Pink salmon *O. gorbuscha* | Low | Low | Low | Low risk of impacting individuals or habitat in the short-term and will likely contribute to increased production and viability for the species in the long-term. |
| Chum salmon *O. keta* | Low | Low | Low | Low risk of impacting individuals or habitat in the short-term and will likely contribute to increased production and viability for the species in the long-term. |
| Coho salmon *O. kisutch* | Moderate to Low | Low – Some mortality of 0 – 1+ parr | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |
| Chinook salmon *O. tshawytscha* | Moderate | Low – Some mortality of 0 – 2+ parr | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |
| Whitefish *Prosopium* sp. | Low | Low – Some mortality of juveniles | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |
| Sculpin *Cottidae* | Moderate | Moderate – Mortality of adult and juvenile scuplin within the project reach are expected | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |
| Stickleback *Gasterosteidae* | Moderate | Low | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |
| Dolly Varden *Salvelinus malma* | Moderate | Low – Some mortality of juveniles | Low | May impact individuals or habitat in the short-term but will likely contribute to increased production and viability for the species in the long-term. |

# Ecology

## *Affected Environment*

The project area contains a numerous old mine tailing piles from the early 1900's. The channel disturbance from the placer mining has simplified channel structure, eliminated large woody debris, coarsened streambed material, cut off the main channel from the floodplain, and eliminated much of the riparian vegetation. Over half the floodplain in the lower section of Resurrection Creek is coarse mine tailings which have not revegetated naturally over the past seventy or more years. The tailings piles support moss and lichen communities, and a few scattered cottonwood, spruce and birch trees that have remained small.

The tailings piles, in addition to being a virtual "botanical desert" compared to typical stream riparian areas in South-central Alaska, also function as dikes preventing normal sediment fertilization and soil formation in the stream channel and floodplains. Lack of soil and soil nutrients has contributed to the lack of re-establishment of normal overstory and understory vegetation. The existing tree cover established in the margins of the tailings piles, and at the edges of the channelized stream, tends to be small, and the amount of standing dead trees and downed woody debris is low. Within the stream channel, the amount of woody debris is also low.

Within the Resurrection Creek watershed supports a variety of plant community types can be found. Type and distribution is influenced by human disturbance including mining and fires, and natural disturbances including the spruce bark beetle infestation, landslide, and avalanche. Plant community types are distributed along topographic, geomorphic, climatic, elevation, and other gradients. Plant community types are identified in Plant Community Types of the Chugach National Forest: South central Alaska (DeVelice et al. 1999) provides community identification and observations from three study plots within the Resurrection Creek watershed. Study plot classification follows the nomenclature and protocol in the Alaska Vegetation Classification developed by Viereck et al. (1992).

Mining has altered current vegetation, particularly in riparian areas directly adjacent to the stream channel where most mining is concentrated. Recreational and commercial placer operations in the Resurrection Creek are the most common and widespread form of mining, and have influenced riparian and floodplain vegetation plant community types including willow, cottonwood, and alder. Mining activities tend to shift vegetation assemblages to earlier seral phases like some of the tall scrub and broadleaf or mixed forest types described by DeVelice et al. (1999).

The dynamic state of the streambanks results in a forest structure with a fairly high proportion of seedling/sapling stage trees. Approximately half of the forested area is in the seedling/sapling stage, with an approximate even division of the other half into pole, medium and large size trees. Very large trees are rare within the project area. Most of the larger trees are cottonwoods on the upper banks, and the occasional live Lutz spruce. In terms of succession, the cottonwood component would eventually be replaced by spruce. Results of past

affects of mining, such as the tailings piles, have altered the normal course of succession by altering floodplain processes of the area.

Floods tend to reset the successional clock for tree species by taking out areas of larger trees, which are replaced by primary succession cottonwoods, especially in riparian areas directly adjacent to the streambanks. This pattern appears when looking at Resurrection Creek for its length. Areas of alder, willow, and cottonwood are concentrated nearest the banks in various ages, and spruce stands border the cottonwood stands further out. Steep areas with bedrock sides are bordered by spruce, and the area straightened is devoid of normal forested cover, with cottonwoods bordering the tailings piles. Large patches of cottonwoods are also found in landslide areas on the upper banks and riparian edges which were bare, and then naturally seeded in with cottonwoods under favorable environmental conditions.

Forested areas near and within the project area have been affected by the spruce bark beetle infestation over the past fifteen years. Ten years following the spruce bark beetle outbreak there was a loss of species diversity and structure within the Resurrection Creek watershed (Holsten et. al. 1995). Forested stands on the east side of the project area, within the Palmer/Resurrection Creek Sale Project area (1996), are comprised mainly of dead spruce interspersed with live mountain hemlock. Formerly forested areas have converted to Calamagrostis canadensis (bluejoint reedgrass); including areas affected by the spruce bark beetle and an area that had been logged in 1985.

The overall project area is characterized, aside from the tailings piles and channelized section of stream, by multi-stream channels, thick patches of reedgrass and oak fern, large patches of open, graminoid and shrub-filled areas; patches of more advanced willow/alder thickets; edge areas influenced by nearby forested cover; and damp areas with cottonwood overstory and heavy horsetail cover in the understory. Within the project area, greater tree age, species diversity, and cover complexity development is apparent in areas further from the stream channel. This includes areas to the east of the Palmer Creek mining claims access road, and to the west of the Resurrection Pass Trail.

For the amount and time period of disturbance, there are surprisingly few nonnative species or obvious affects of the road and trail on species diversity or distribution. However, a noticeably higher presence and abundance, of early successional and disturbance species occur in the project area. These species grow immediately around the tailings piles, structures, roads, and trail as compared to the reference reach of the stream.

Special considerations in terms of ecology and vegetation include the introduction of non-native species and the conservation and protection of sensitive plant species. Development and human caused disturbances have provided for the introduction of non-native species to the project area. Vehicles and human beings (via clothing and boots) are vectors for dispersal and spread of these plants. Non-native species are most typically found in immediate areas around developed and disturbed areas within and around the project area. Generally, the known populations in the project area have not presented a threat

to native vegetation, although populations can spread rapidly with increased activity in the project area (Myers and Bazely 2003). Known populations of non-native species within the project area include butter-n-eggs (*Linaria vulgaris*), common dandelion (*Taraxacum officinale*), white sweet clover (*Trifolium repens*), common chickweed (*Cerastium fontanum),* timothy (*Phleum pratense*), common plantain (*Plantago major*), and others.

Sensitive plants, like other plants, are influenced by various biological, chemical, and physical environmental gradients or regimes. The project area has potential habitat for sensitive plants, particularly in the riparian corridor. A bioenvironmental database developed by Dr. Robert L. DeVelice, Chugach Forest Ecologist, was used to create maps of the potential distribution maps of all rare and sensitive vascular plants known or suspected to occur on the Chugach National Forest. Maps compare characteristics of the different bioenvironmental model regimes to potential habitat for each of the 10 species of the sensitive plants that are known or suspected to occur on the Chugach National Forest. Of these, five are identified as potentially occurring in the Resurrection Creek watershed, including *Aphragmus eschscholtzianus, Draba kananaskis, Carex lenticularis var. dolia, Arnica lessingii ssp. norbergii*, and *Papaver alboroseum*.

### *Environmental Consequences*

Comparison of alternatives in terms of vegetation ecology will be based on the following parameters:

- Number of trees harvested in the project area
- Percent cover and species of trees harvested in the project area
- Length of new road and trail construction, or reconstruction of existing
- Amount area of revegetation
- Area of camping
- Area open to recreational gold panning activities
- Number and location of bridge crossings or stream crossings
- Area of potential sensitive plant habitat effected
- Area of potential non-native species introduction

### Alternative 1 – No Action Alternative

### Direct and Indirect Effects

Under the No Action Alternative, the project area will remain in a disturbed condition from historic mining activity. Ecological pattern, process, and function will not return to a healthy state, as described in the desired future condition for vegetation in the Chugach Forest Plan (page 3-13). Vegetation cover typical of Southcentral Alaskan stream systems will not return to the area due to the tailings piles and channelized streambanks. There will be a loss of opportunity

for return of the Resurrection Creek area to a proper functioning ecological system in terms of native vegetation, hydrology, and fish and wildlife habitat.

Recreation users may expect to visit Alaska or Resurrection Creek and see a mainly pristine environment. Certain users may experience a loss of scenic quality in terms of what a proper functioning riparian system would look like. However, the changes in scenic quality still meet the Chugach Forest Plan Standard of the Low scenic integrity objective. Refer to the recreation resource environmental consequences section of this chapter for more information on scenic resources.

*Cumulative Effects*

Dispersed camping and unregulated recreational gold panning in parts of the project area creates a higher probability of non-native species establishment and spread. This concern is part of a larger issue of non-native species spread along trail and river systems in South-central Alaska.

## Alternative 2– Proposed Action

### Direct and Indirect Effects

All of the action alternatives (Alternatives 2 through 6) will work to restore the project area to its proper functioning ecological condition. The Chugach Forest Plan (page 3-13) describes the desired future condition in terms of vegetation:

> *"Vegetation on the Chugach National Forest will be the vegetation that results from natural processes. Selected locations will be altered by management activities either to restore degraded conditions or to provide benefits to wildlife. The abundance and distribution of sensitive plants will be stable. Exotic plant infestations will be decreasing in size."*

The proposed action, Alternative 2, maximizes the efforts and area involved to move the Resurrection Creek area towards the desired future condition for the Forest. This alternative would restore 1.1 miles of Resurrection Creek's channel, floodplain and streamside vegetation to pre-mining conditions and enhance fish and riparian wildlife habitat.

*Number of trees harvested in the project area:* Harvesting up to 5,000 trees from the project area, with or without root wads, would have the immediate effect of changing the appearance of the area, particularly as viewed from the Resurrection Pass trail, reducing the scenic quality for certain recreation users. There would be changes in the general appearance of the project area until the vegetation grows back in areas of intense activity. The area may appear messy, barren, or uninviting to recreational users for a period of several years during and immediately after project activities.

Forest structure will change from primarily understory reinitiation phase with some possible small areas of old growth (Oliver and Larsen 1990) to a mix of stand initiation and understory reinitiation, with small pockets of possible old

growth. Additional trees may come from the Hope Highway Fuels Reduction Project area for use in project implementation.

*Percent cover and species of trees harvested in the project area*: Approximately 50% of large to medium (meaning trees sized from 15 to 25 inches in diameter at breast height) (dbh)) spruce (*Picea lutzii)* and cottonwood (*Populus balsamifera*) would be retained. These trees will provide the materials necessary for project activities, and retain enough tree cover for wildlife habitat needs, as well as contributing to the current and future structure of the riparian forests. This is a fairly conservative percentage for removal in terms of typical fuel reduction activities on the Kenai Peninsula. Almost all of the spruce is dead and dying in all size classes although there are some live spruce stands. Percent cover retained will have an impact on natural regeneration. Cottonwood will regenerate in open conditions and spruce regenerates better with some overstory cover. A concern with spruce regeneration is that harvest in wet areas may encourage the establishment of virtual monocultures of bluejoint reedgrass (*Calamagrostis canadensis*) preventing the establishment of spruce seedlings. Removal of only 50 percent of medium and large size classes may hinder regeneration of cottonwood but may be beneficial in reestablishing spruce stands.

The above parameters will have the greatest impact in setting the stage for the future composition and structure of the forested areas in the project area. In addition, proposed actions address the guidelines in the Chugach Forest Plan (page 3-25) in terms of vegetation management:

> *"On the Kenai Peninsula, maintain aspen, paper birch, alder, and cottonwood as an early successional component. Consider retaining live trees for future reserve tree recruitment."*

Overall ecosystem health, as well as wildlife and fish habitat, and long-term sustainability of the site in an ecologically functioning conditions, requires, in part, a mix of different stand structure classes and species. By removing certain size classes of trees and certain species, future stand structure diversity can be created. What is today stand initiation will be stem exclusion and later understory reinitiation. Ideally, structure classes would be a balance of stand initiation, stem exclusion, understory reinitiation, and old growth. This is an ideal seldom achieved in the natural world, particularly with fast-growing, short-lived species like cottonwood. However, working with the concept of forest stand dynamics in mind sets guidelines for removal, and provides a picture of what the project area will look like in the future following restoration activity completion.

Dead spruce removal in particular, would reduce the fuel load for the project area, along with the risk of wildfire. The project area is located near the community of Hope, which is at risk from wildfire due to the spruce bark beetle epidemic and high fuel loads from dead, dying, and falling spruce.

Additional use of trees from the Hope Highway project would not affect the ecology in terms of vegetation of the project area.

*Length of new road and trail construction, or reconstruction of existing*: The approximate 0.35 miles of new road construction, required to relocate an existing section of the road to Palmer Creek out of the floodplain, would remove trees and

understory vegetation from the project area. Trees removed in road construction can be used for project materials in stream restoration. Effects of road construction on vegetation would be low. In terms of trails, a 0.3 mile segment of the Resurrection Pass National Recreation Trail would be permanently rerouted around the project area to provide a safe route for trail users during restoration activities. Moving the trail up the slope break would require removal of trees and understory vegetation. Effects in the overall project area are minimal. Removed trees may be used in restoration activities.

*Amount area of revegetation:* Revegetation activities for restoration will help create the mosaic of different stand structure and composition, along with tree harvesting activities. The proposed action includes restoration activities using revegetation along the length of the project area. The Chugach Forest Plan (page 3-25) contains the following guidelines in terms of revegetation: "use natural revegetation where seed source and site conditions are favorable towards achieving revegetation objectives," and "use native plant species in revegetation/restoration projects when natural revegetation conditions are not favorable."

Revegetation work in the project area would include planting of rootstock, seeding, sod planting, and natural revegetation through seed sources. Revegetation is a vital part in returning the project area to an ecologically functioning condition, and would have a strongly positive effect in terms of the project area's vegetation ecology. Planted rootstocks, seeds, sod, or natural regeneration will establish understory, and anchor the new banks after construction activities, preventing erosion, loss of soil, and contributing to the plant diversity.

*Area open to camping*: Dispersed camping would continue although vehicular access would be blocked by barrier rocks or other impediments. Prohibiting vehicles directly adjacent to the riparian areas will have a positive effect on vegetation by preventing heavier amounts of trampling and wear on the banks. Erosion may be reduced.

*Area open to recreational gold panning activities:* Recreational gold panning would continue to be allowed north (downstream) of the Haun Trust Lands, below where the major project activities will take place. The effect on vegetation, by prohibiting recreational gold panning within the areas of restoration, will be positive, as mining activities can destroy streambank vegetation. Revegetation efforts will be more protected. Vegetation will be able to establish itself more quickly.

*Number and location of bridge crossings or stream crossings*: In this alternative, a temporary modular or log stringer bridge would be built over the combined channel of Resurrection and Palmer Creeks with a temporary timber crib and tailings waste. A smaller temporary bridge over Palmer Creek would also be built. Minimizing heavy equipment use in the stream channel on the stream banks would help prevent further trampling and destruction of existing vegetation, and avoid compaction of streambank soils. Effects on vegetation would be

minimal following construction of the bridge, with initial loss of vegetation and some bank trampling during construction of the two bridges.

*Area of potential sensitive plant habitat affected:* The project area contains potential habitat for several of the listed sensitive species. These habitats include the direct edges of the streambank, rock wall areas in the stream channel, bog areas, and forested areas. The Chugach Forest Plan has the following guideline for sensitive plants (page 3-27): "avoid, minimize, or mitigate the effects of human activities in areas containing sensitive plant populations." With no known sensitive plant populations in the project area, activities will not effect the overall populations on the Forest.

*Area of potential non-native species introduction:* The entire project area is at risk for introduction of non-native plant species, which are typically transported into new places by foot, by car, by off road vehicle, by horse or horse feed, by bike, or by construction or logging equipment. There are already known populations of several non-native species on the Haun Trust Lands within the project area. Project activities are likely to cause the expansion of these populations, especially if restoration equipment crosses roads on this land, trails on this land, or drives on any part of the property.

Small populations of non-native species also persist in the surrounding mine claims near Palmer Creek. At this time, populations are small and limited to areas of low forest cover, in the open parking areas, roadsides, trails, and around the structures on private land. The Chugach Forest Plan has the following guideline for non-native species management in terms of projects (page 3-25): "incorporate exotic plant prevention and control into project planning and design." Non-native seeds can spread more quickly down stream corridors, dispersed by the power of the current. The effect of constructing bridges and avoiding stream crossings is positive in terms of preventing non-native species spread. However, all restoration activities using motorized equipment have the potential to spread or introduce new populations of non-native species. Monitoring and treatment efforts (in the mitigation section) will help prevent population explosions, and spread up and down the trail system and stream corridor within and beyond the project area.

### *Cumulative Effects*

Angler and other recreational traffic is not expected to increase by much in the project area, and is not expected to have negative effects on the restored streambank vegetation after a period of three to five years, when the rootstock species have had time to establish, and other native vegetation has had time to establish itself from seed source. The critical period of time, when any visitation to the area could have effects on the success of vegetation establishment or reestablishment, is the year immediately following the completion of restoration work. Angling, horseback riding, hiking, biking, camping, running, or other user traffic on revegetated areas could destroy planting efforts and prevent seeds from germinating on site. Rerouting the Resurrection Pass Trail during and

following project activities will assist in diverting foot, bike, and horse traffic off fragile revegetated areas during establishment periods.

This project, in conjunction with the nearby Palmer Creek Fuel Reduction project, and even the Hope Highway project, will have the net effect of reducing the fuel load around the community of Hope, and reducing the risk of wildfire within and near the community, by the removal of dead spruce.

### Alternative 3

### Direct and Indirect Effects

Alternative 3 has the same direct and indirect effects as Alternative 2, with the following changes:

*Length of new road and trail construction, or reconstruction of existing:* Alternative 3 contains more new road construction than Alternative 2. The effect is more net loss of vegetation at the project start, although overall effects to vegetation are small. Trees removed can be used as restoration material. The Resurrection Pass North Trailhead would be reconstructed. The trailhead expansion area does not have existing vegetation since it is composed of tailing piles. The trail reroute will be temporary, which would not effect vegetation overall, as there is already a cleared trail area.

*Area open to camping:* The existing dispersed camping area would be relocated to a new dispersed camping site with revegetation of the site. Effects would be positive in terms of vegetation ecology.

*Area open to recreational gold panning activities:* The biggest difference from Alternative 2 is that recreational gold panning activities would continue within the project area, including the upper areas where revegetation and restoration work would take place. Recreational gold panning in these areas will have negative effects in terms of revegetation success, restoration success, and continued healthy functioning streambanks.

*Area of potential non-native species introduction:* More road construction, campsite moving and expansion, and trailhead expansion provides more areas of potential non-native species populations to begin and spread.

*Cumulative Effects*

Alternative 3 has the same cumulative effects as Alternative 2, with the following addition:

Recreational mining access will cause increased use in critical areas of revegetation. Recreational use may be highest in this alternative, causing greater impacts to existing vegetation and to revegetation work.

### Alternative 4

*Direct and Indirect Effects*

Alternative 4 has the same direct and indirect effects as Alternative 2, with the following change:

*Number and location of bridge crossings or stream crossings:* This is similar to Alternative 2, with construction of two bridges, but this Alternative adds another bridge over the Resurrection Creek Diversion Channel. Alternative 4 also includes multiple equipment crossings taking place across Resurrection Creek to access the restoration areas. Effects to streambank vegetation with increased river level crossings are negative, causing soil compaction, greater erosion potential, more exposure of the river corridor to potential non native species introductions, and damage to existing streambank vegetation. The trail reroute is also temporary in this alternative, with no net effect to vegetation.

*Cumulative Effects*

Alternative 4 has the same cumulative effects as Alternative 2, with the following addition:

Multiple equipment crossings and disturbance to streambanks may invite further trampling of these areas by recreational users, particularly in areas where vegetation is cleared for access, providing a clear path for users to other parts of the streambank. Revegetation work may be slowed or impacted by this increased use.

### Alternative 5

*Direct and Indirect Effects*

Alternative 5 differs from Alternatives 2, 3, and 4 in the amount and length of restoration activity that would take place. This alternative would restore less area than the previous three action Alternatives. In this Alternative, 0.6 miles of the uppermost portion of the Resurrection Creek channel, floodplain and streamside vegetation would be restored to pre-mining conditions to enhance fish and riparian wildlife habitat. There will be similar amounts of tree harvest and percent harvest removal. New road construction, bridge construction, and Resurrection Pass trail rerouting during the project activities is the same as in Alternative 2, although the trail reroute is temporary in this alternative. Recreational gold panning restrictions are the same as in Alternative 2. Sensitive plant habitat effects are similar to the previous action alternatives.

*Amount area of revegetation:* Less area would be revegetated, resulting in a loss of opportunity to return a greater section of the Resurrection Creek watershed that had been affected by past mining activity to an ecologically functioning condition. Although some revegetation will take place, the area covered will be smaller. Techniques and sources will be the same.

*Area open to camping:* This alternative will have no change in the current camping area. Effects to vegetation on the streambanks and riparian area would continue to be negative, with vehicles able to drive to the water's edge, resulting in trampling and destruction of riparian vegetation, soil compaction, and trash dispersal.

*Area of potential non-native species introduction*: Less area of restoration activity would reduce the risk of spread on non-native species to more areas through transport on motorized equipment. However, less project area covered by activities leaves less known about existing populations within the project area,

and less area that is restored to a healthy functioning condition, which theoretically would not contain any non-native species populations.

*Cumulative Effects*

Alternative 5 has the same cumulative effects as Alternative 2.

### Alternative 6

*Direct and Indirect Effects*

Alternative 6 has the same direct and indirect effects as Alternative 5, although more area is included for restoration (a 0.5 mile channel stretch). Also included are the following differences:

*Length of new road and trail construction, or reconstruction of existing*: Alternative 6 has slightly more length of new road construction, but effects will be similar in terms of vegetation. There would be a loss of vegetation in the construction area, but trees harvested may be used for restoration activities. The trail reroute is also temporary in this alternative, with no net effect to vegetation.

*Number and location of bridge crossings or stream crossings:* This alternative includes multiple equipment crossings taking place across Resurrection Creek to access the restoration areas, and construction of two bridges. Effects to streambank vegetation with increased river level crossings are negative, causing soil compaction, greater erosion potential, more exposure of the river corridor to potential non-native species introductions, and damage to existing streambank vegetation.

*Cumulative Effects*

Alternative 6 has the same cumulative effects as Alternative 2.

### Summary of Effects by Alternative

*Alternative 1:* The project area would not be returned to an ecologically functioning condition.

*Alternative 2-4:* Restoration activities would have the greatest impact in returning the project area and overall Resurrection Creek watershed to an ecologically functioning condition. Vegetation would be altered and removed within the project area during project activities. Restoration work would re-establish native vegetation in the riparian corridor where it is currently lacking. The appearance of the riparian forest would change. The structure and composition of the forested areas will be altered by removal of whole trees of different size class and species.

*Alternatives 5-6:* Restoration activities would have some impact in returning the project area to an ecologically functioning condition. Effects would be similar to those of Alternatives 2-4, but in a smaller area. Restoration activities would not be as effective in restoring the greater watershed of Resurrection Creek as in the previous alternatives, but the effects would be the same.

# Wildlife

## *Affected Environment*

### Habitat

The area adjacent to Resurrection Creek is composed of 74% cottonwood and 26% Lutz spruce with birch and hemlock making up only a fraction of a percent of the composition. Stand structure is in the seedling/sapling class and no large trees were observed. With the relatively young age of existing stands, snags and downed wood are virtually absent. The habitat is best for species that use early successional stages, hardwoods, and riparian areas. Lack of downed woody material makes it less than optimal for many small mammals. Lack of snags reduces the habitat quality for cavity nesting birds and mammals, and reduces quality for raptors that use snags for nesting, roosting, or perching. The adjacent slopes contain a mixture of mixed hardwoods, birch and spruce. (Bair et al 2002).

Surveys of the project reach by Bair et al in 2002 identified that mine tailings produced by placer mining nearly a century ago had significantly altered fish and wildlife habitat within the project reach by confining and straightening the stream, increasing the channel slope by 27%, and homogenizing the reach by creating a nearly continuous riffle with few pools or spawning gravel for fish. The dikes created by the mine tailings prevent fine sediment and organics carried by floods from being deposited on the floodplain, preventing natural fertilization and soil augmentation needed to reestablish vigorous riparian communities.

Although the mining disturbance occurred nearly a century ago, riparian vegetation and wildlife habitat have not recovered at a natural rate of succession; 86% of all riparian trees within the disturbed reach are less than 15 cm in diameter with snags and coarse downed wood nearly nonexistent. Without regeneration of riparian vegetation habitat, conditions for bears, bald eagles, moose and salmon, migratory birds, will be extremely limited within the project reach for generations to come (Bair et al 2002).

### Wildlife of Interest (TES, MIS, and SSI)

The following Threatened, Endangered, or Sensitive (TES) species, Management Indicator species (MIS), and Species of Special Interest occur on the Chugach National Forest.

**Table 5 MIS, TES, and, SSI on the Chugach National Forest**

| SPECIES | MIS | TES | SSI |
|---|---|---|---|
| Brown Bear | X | | |
| **Black Oystercatcher* | X | | |
| **Dusky Canada Goose* | X | X | |
| Moose | X | | |
| Mountain Goat | X | | |
| Gray Wolf | | | X |
| Lynx | | | X |
| Marbled Murrelet | | | X |
| **Montague Island Hoary Marmot* | | | X |
| River Otter | | | X |
| *Sitka Black-tailed Deer* | | | X |
| Townsend's Warbler | | | X |
| Wolverine | | | X |
| Bald Eagle | | | X |
| *Humpbacked Whale (Endangered)* | | X | |
| *Montague Island Tundra Vole* | | X | |
| Northern Goshawk | | | X |
| *Osprey (Sensitive)* | | X | |
| *Peale's Peregrine Falcon* | | X | |
| *Steller Sea Lion (Endangered)* | | X | |
| *Trumpeter Swan (Sensitive)* | | X | |
| *Steller"s Eider (Threatened)* | | X | |

Primary pref. = xx; secondary pref. = x; minor habitat pref's not indicated;*=breeding, #=probable breeding, +=possible breeding

The species listed in italics above do not occur on the Seward Ranger District, or in the project area, (see wildlife specialist report in the project record), or for the reasons listed below, and will not be analyzed further.

## TES, MIS, and SSI of the Project Area

The following species are either known to occur or potential habitat may exist in the project reach.

**Table 6 MIS, TES, and SSI, which may occur in the Resurrection Creek Restoration, project area**

| SPECIES | MIS | TES | SSI |
|---|---|---|---|
| Brown Bear | X | | |
| Moose | X | | |
| Gray Wolf | | | X |
| Lynx | | | X |
| River Otter | | | X |
| Townsend's Warbler | | | X |
| Bald Eagle | | | X |
| Northern Goshawk | | | X |

### Threatened, Endangered & Sensitive Species

There are no threatened, endangered, sensitive or proposed species that are likely to occur in the project area, or will be affected by this project

### Management Indicator Species

Management Indicator Species are the moose, brown bear and mountain goat. Habitat for Mountain goats does not occur in the project reach. The management indicator species are used to direct implementation, inventory, and monitoring activities set objectives for maintenance and improvement of habitat, and quantify the amount and quality of habitats and population trends for the watershed.

*Moose:* Moose populations on the forest are stable, but habitat is declining, which will likely cause a decline in the population over time. Currently, ADF&G considers habitat on the Seward Ranger District to be of low quality and capable of supporting only about 2 moose per square mile. Density surveys conducted on the Kenai National Wildlife Refuge showed estimates of 10 moose/square mile in high quality habitat produced by a wildfire in 1969 (U.S. Fish and Wildlife Service 1992). Without additional habitat disturbance to produce early successional stands, moose densities may decline to approximately 0.7 moose/square mile over the next 20 to 30 years (Howell 1990).

Moose are primarily associated with early-mid successional habitat and riparian areas. Winter range, or the available hardwood forage below 1000' elevation, is the primary factor limiting the moose population. The juxtaposition of feeding and old growth hiding/thermal cover is also important, especially in areas of large-scale disturbance (Renecker and Schwartz 1998).

During fall and winter, moose consume large quantities of willow, birch, and aspen twigs. Moose eat a variety of foods, particularly sedges, equisetum (horsetail), pondweeds, and grasses. During summer, moose feed on vegetation in shallow ponds, forbs, and the leaves of birch, willow, and aspen. Most moose

make seasonal movements for calving, rutting, and wintering areas. They travel anywhere from only a few miles to as many as 60 miles during these transitions.

Moose use the project reach during the rut and for winter range. Restoration activities, such as creating moose ponds and regenerating early successional hardwoods such as birch and cottonwood will improve moose habitat.

*Brown Bear:* Brown bears have large home range requirements and an intolerance of human disruption and development. The Kenai Peninsula population is estimated at 280 bears, or 12 bears/1000km2 (Suring et. al. 1998). The primary limiting factor for brown bears on the Peninsula is spring and summer feeding habitat. South facing hillsides and avalanche chutes, big game winter ranges, and salmon streams provide the high quality forage needed by bears before and after denning.

The project area contains primarily moderate value bear habitat. The project reach is within moose winter range and Resurrection Creek is anadromous, providing foraging habitat.

Brown bear habitat can be maintained or improved by improving moose winter range, maintaining or improving riparian habitat quality, limiting development near salmon streams, reducing risk of bear human interactions through sensible recreation planning and public education. Provide buffers along anadromous fish streams to provide screened foraging habitat and managing human activity to minimize encounters as per the Forest Plan. Identify important feeding areas in cooperation with the Alaska Department of Fish and Game, and identify buffer zones as identified in the forest plan.

## Species of Special Interest

Species of Special Interest are the gray wolf, lynx, river otter, marbled murrelet, Townsend's warbler, wolverine, bald eagle, northern goshawk and osprey.

### *Gray wolf*

Wolves are highly social animals and usually live in packs that include parents and pups of the year. Although pack size usually ranges from 2 to 12 animals, packs of as many as 20 to 30 wolves sometimes occur. The average size pack is 6 or 7 animals. There are approximately 10-11 packs on the Seward District, one pack may exist in Resurrection Creek.

In most areas wolf packs tend to remain within a territory used almost exclusively by pack members, with only occasional overlap in the ranges of neighboring packs. In Alaska the territory of a pack often includes from 300 to 1,000 square miles of habitat with the average being about 600 square miles. Wolves normally breed in February and March, and litters averaging about five pups are born in May or early June. Pups are usually born in a den excavated as much as 10 feet into well-drained soil, and most adult wolves center their activities around dens

while traveling as far as 20 miles away in search of food, which is regularly brought back to the den. Wolves are great travelers, and packs often travel 10 to 30 or more miles in a day during winter. Dispersing wolves have been known to move from 100 to 700 miles from their original range.

In spite of a generally high birth rate, wolves rarely become abundant because mortality is high. In much of Alaska, hunting and trapping are the major sources of mortality, although diseases, malnutrition, accidents, and particularly intra-specific strife act to regulate wolf numbers. Wolves are carnivores, and in most of mainland Alaska moose and/or caribou is their primary food, with Dall sheep being important in limited areas. On the Kenai Peninsula, all the wolves have lice. Habitat is fair, and could be improved by improving moose habitat (personal communication with Ted Spraker, AKFG).

Maintaining abundant populations of prey species, controlling access on new roads and working with ADFG to reduce or eliminate illegal harvest are the primary methods for maintaining healthy populations in the watershed.

Improving moose habitat in the project area should be beneficial to wolves.

### *Lynx*

Lynx inhabit much of Alaska's forested terrain and use a variety of habitats, including spruce and hardwood forests, and both sub-alpine and successional communities. The best habitat occurs where there is a diversity of vegetation types with an abundance of early successional growth, which provides habitat for snowshoe hare and other small prey species. Hares also like dense conifer thickets of seedlings and saplings for food and cover.

Mating occurs in March and early April and kittens are born about 63 days later under a natural shelter such as a wind fallen spruce, a rock ledge, or a logjam. The production and survival of lynx kittens is influenced dramatically by cyclic changes in snowshoe hare and other small game populations. Roads may also affect populations by increasing the vulnerability of lynx to hunters and trappers. Current populations are believed to be below historical high levels.

Maintaining or promoting early stages of spruce and hardwood forests and vegetative diversity will promote or maintain lynx habitat. Developing a more diverse mix of vegetation and successional stages, maintaining some of the early successional hardwoods will be beneficial to lynx.

### *Marbled Murrelet*

Marbled Murrelets are medium sized seabirds that inhabit near-shore coastal waters, inland freshwater lakes, and nest in inland areas of old-growth conifer forest or on the ground (Carter and Sealy 1986, Marshall 1988). They are usually found within 5 miles of shore. Except for the fall period when they are molting, flightless, and stay on the ocean, murrelets are known to fly to tree stands throughout the year.

Throughout much of its range in the Pacific Northwest, British Columbia, and Alaska, the marbled murrelets nest in large, mature coniferous trees within stands of structurally complex, coastal old-growth forest. Data from forested areas elsewhere within their range indicate that high volume stands of old-growth conifer forests in relatively close proximity to the coast are essential nesting habitat.

Murrelet show a decreasing population trend within the Chugach National Forest are generally downward for the long-term, with a 67 percent decline since surveys were done in 1972 and 1973. However, populations have been stable since 1990 (Kuletz 1997). Possible causes of estimated overall Alaska declines are oil spills, mortality from gill netting, cyclic changes in marine food productivity, and the harvesting of productive old-growth forests (which are likely their primary nesting habitat)

Surveys for marbled murrelets were conducted at inland sites on the Chugach National Forest. Kenai Peninsula in 1991, 1994, and 1995 (USDA Forest Service, unpublished data). Number of detections ranged from 23 in 1994 to 101 in 1991 documenting the presence of this bird on this portion of the Chugach National Forest. Potential nesting habitat for marbled murrelets may exist in the watershed.

Old growth habitat, which could serve as potential nesting habitat in the watershed is being lost due to the impacts of the spruce bark beetle. Old growth habitat that is not infected, especially within 5 miles of the coast, should be maintained, and old growth characteristics such as large trees and structurally complexity could be promoted through thinning in mature stands to enhance or create nesting habitat.

Currently, old growth habitat does not exist within or directly adjacent to the project reach. The spruce bark beetle has killed most of the mature spruce in the surrounding area. Murrelets are unlikely to occur within or adjacent to the project area.

*River Otter*

River otters are associated with coastal and fresh water environments and the immediately adjacent (within 100-500 feet) upland habitats. Beach characteristics affect the availability of food and cover, and adjacent upland vegetation also provides cover. Old-growth forests have the highest habitat value, providing canopy cover, large-diameter trees and snags, and burrow and den sites. Younger successional stages provide lower quality habitat.

River otters in Alaska hunt on land and in fresh and salt water. They eat snails, mussels, clams, sea urchins, insects, crabs, shrimp, octopi, frogs, a variety of fish, and occasionally birds, mammals, and vegetable matter.

They travel several miles overland between bodies of water and develop well-defined trails that are used year after year. A family unit is made up of a female

and her pups, with or without an adult male. The family usually travels over an area of only a few square miles.

River otters have no significant predators except man. There is some concern that developed recreation may impact their populations.

Due to increasing losses of old growth habitat from the spruce bark beetle, some high quality habitat for otters may be declining. Efforts to promote or maintain mature or old growth trees, canopy cover, and snags and downed logs adjacent to fresh water environments will help maintain otter populations. Restoration alternatives should be beneficial to otters.

*Townsend's warbler*

Townsend's warblers are fairly common breeding birds on the Chugach National Forest. In the fall, Townsend's warblers may depart interior Alaska by late August.

Townsend's warblers can be found primarily in coniferous forests or mixed forests where coniferous trees comprise a predominant feature of the habitats (Bent 1953, Erskine 1977).

In central Alaska, Townsend's warblers were the most abundant breeding birds in white spruce dominated mature forests (Spindler and Kessel 1980). They also occurred in mixed coniferous-deciduous forests. On the Kenai Peninsula, Townsend's warblers were the most abundant breeding bird in 50- and 100-year old stands (Quinlan 1979).

Studies in Southeast Alaska suggest a preference for older conifer forest. On the Kenai Peninsula, Quinlan (1979) reported that densities of Townsend's warblers in 30-year-old white spruce forest plots were less than half that found in 50- to 100-year-old white spruce forests.

At present little information on population trends in Canada or Alaska is available (Wright et al. 1998).

Mature and old growth habitat is being lost due to the impacts of the spruce bark beetle. Old growth habitat in the surrounding area that is not infected should be maintained, and old growth characteristics such as large trees and structurally complexity could be promoted through thinning in mature stands to enhance or create potential habitat.

The project reach contains poor habitat conditions for Townsend's warblers.

*Wolverine*

The wolverine is an animal of montane forest, tundra, and taiga. Several factors appear to influence wolverine habitat selection at the landscape and stand levels. The distribution and density of large mammal carrion is a primary factor along with the level of human disturbance. Other habitat parameters such as escape cover from predators, availability of den sites, prey concentrations, and cover can affect daily movement and habitat use patterns (Howell 1999).

Wolverine in Idaho showed a significant preference for high elevation, rocky habitats in summer and montane conifer communities in winter. Females showed a specific preference for den sites and talus slopes, which were neither widely available nor evenly distributed across the landscape (Copeland 1996). Wolverines do not appear to avoid habitats inhabited by other predators, or areas with large openings.

Wolverines are primarily scavengers, found in the wilder and more remote areas of Alaska. They have tremendous physical endurance and can travel up to 40 miles a day in search of food. The breeding season extends from May through August. The abundance of food determines whether a pregnancy will be maintained (delayed implantation) and the number of young that will be born. Wolverine litters are born between January and April. In Interior and northern Alaska most young are born in snow caves. These caves usually consist of one or two tunnels that can be up to 60 yards long. Wolverines travel extensively in search of food. Home range sizes are vast, with adult males using areas up to 240 square miles. Adult females use smaller home ranges encompassing between 50 to 100 square miles.

The primary natural mortality factors are starvation and being killed by other predators, primarily wolves. However, most wolverine mortality is due to trapping by humans.

Human settlement and disturbance may have been a primary factor in the extirpation of the wolverine from much other historic range (Wilson 1987). As a general rule, management actions that increase human access into remote areas, decrease the amount or distribution of carrion available, or disrupt sensitive areas such as denning habitat or dispersal corridors will decrease the effectiveness of wolverine habitat (Banci 1994).

Wolverine surveys were conducted in 1992 in February as part of a cooperative project with AKFG, KNWR, CNF, and KFNP. Wolverine tracks were located in Resurrection Creek. In the north, tracks were most abundant along Resurrection and Juneau Creeks, Sixmile, and Canyon Creeks. The closest tracks were located in Palmer Creek, just east of the project area. A den site was located in Gold Gulch Creek, about a 1 mile from the project area.

The project area does not provide suitable denning habitat. Wolverines may travel through the project reach while foraging. Restoration actions that improve moose habitat, and close any new roads developed during restoration work so as to reduce new access may be beneficial to wolverines.

### *Bald Eagle*

Bald Eagles are more abundant in Alaska than anywhere else in the United States. Bald Eagles are often found along Alaska's coast, offshore islands, and Interior lakes and rivers. Most Bald Eagles winter in southern Alaska, but some leave the state during cold months. Bald Eagles often use and rebuild the same nest each year. Nest trees are usually close to water, afford a clear view of the surrounding area, and often provide sparse cover above the nest. Eagles in

South-central Alaska nest in old cottonwood trees near water. Nest building begins in April. In late April, two-three eggs are laid several days apart. Incubation lasts about 35 days. When the young hatch, sibling rivalry is common and the weaker, usually the younger, chick is killed or starved. The surviving young leave the nest after approximately 75 days. Bald Eagles congregate where food is plentiful, and they may continue to roost near the nest tree.

Pesticides in the eagles' prey can affect reproductive success. Alaska Bald Eagles seem to be reproductively healthy, but contaminants have been recorded in Alaska fish populations and in Bald Eagles. A greater threat to Alaska's Bald Eagle population is destruction of their nesting habitat by logging and nest disturbances. Nest trees tend to be the largest in the stand and are usually 400 years old. Fish are the main diet of the Bald Eagle. Herring, flounder, Pollock, and salmon are taken along the coast, while the Interior populations prey heavily upon salmon. Eagles also prey upon waterfowl, small mammals, sea urchins, clams, crabs, and carrion.

Bald eagle nest protection standards are outlined in an Interagency Agreement with the U.S. Fish and Wildlife Service. There is a 330-foot retention zone around known eagle nest locations. There are also blasting, road construction, and over flight restrictions. The active bald eagle nesting season is generally from March 1 to August 31.

Eighty two percent of all bald eagle nests on the Seward Ranger District are in mature cottonwood trees with an average diameter of 31 inches and within one quarter mile of an anadromous fish bearing stream. There is a significant lack of such trees in the watershed association, in part due to past mining activities.

Active management is needed to preserve existing nests and potential nest trees and contribute to regeneration of new stands of cottonwoods that could contribute to future recruitment. The growing population of beavers in abandoned settling ponds and clearing from placer mining pose a risk to existing large cottonwoods. There has been little regeneration of cottonwoods in existing riparian zones as a result of stream channelization from placer mining on Resurrection Creek and the major tributaries, disconnection of channels from their historic floodplains, and loss of riparian soils.

No nests are known to occur in the project reach, which is extremely limited in mature cottonwoods. The closest nest occurs approximately 3 miles to the north. Numerous nests occur near Hope along the coast.

Habitat management in the project area should focus on retaining large old cottonwoods for nesting habitat, promoting future nesting habitat, and reducing disturbance near nest trees.

### *Northern Goshawk*

The northern goshawk is a low density, forest raptor that feeds in the under story on squirrels, birds and snowshoe hares. The amount and juxtaposition of feeding and nesting habitat appears to be the primary limiting factors (Iverson et. al. 1996). Thirteen of 17 known goshawk nests on the SRD are in old growth hemlock-spruce stands characterized by a closed canopy, large average diameter, gap regeneration and an open under story.

The spruce bark beetle infestation is accelerating the rate at which spruce disappear from old growth stands. Eight nests have been located in lower Resurrection Creek watershed in what appears to be 3 territories.

The spruce bark beetle infestation is altering habitat structure in old growth stands favored by the northern goshawk by accelerating the rate of spruce tree mortality, canopy closure, and understory cover. Although loss of spruce does not directly affect nest stands, it does affect the amount and quality of feeding habitat and prey availability near nest sites. Old growth habitat that is not infected should be maintained, and old growth characteristics such as large trees and structural complexity could be promoted through thinning in mature stands to enhance or create potential habitat. Some nesting habitat can be promoted in mature hemlock stands by thinning to reduce competition, increase growth, and open the under story, while retaining denser canopies. This may help replace losses of some nesting habitat in mature spruce due to the bark beetle.

One nest occurs within 0.5 miles of the project area to the east. Several more occur to the northwest and north east in Cripple Creek and Bear Creek.

Mature and old growth habitat is being lost due to the impacts of the spruce bark beetle. Old growth habitat in the surrounding area that is not infected should be maintained, and old growth characteristics such as large trees and structurally complexity could be promoted through thinning in mature stands to enhance or create potential habitat.

### *Migratory Birds*

On January 10, 2001, President Clinton signed an Executive Order for the “Responsibilities of Federal Agencies to Protect Migratory Birds” which directed the federal agencies to develop an MOU with the US Fish and Wildlife Service to promote conservation of migratory birds. Agencies shall identify potential impacts to migratory birds and their habitats, avoid or minimize adverse impacts, restore and enhance habitats, and evaluate the effects of actions on migratory birds. Where they exist, other analyses should be used, such as the Boreal Partners in Flight “Land bird Conservation Plan for Alaska Bio-geographic Regions version 1.0.” in which priority species by habitat for Alaska are identified.

In addition, the US Fish and Wildlife Service identified a list of species in the Alaska Region as Birds of Conservation Concern in 2002, to ”identify species, subspecies, and populations of all migratory non-game birds that, without

additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973."

The Chugach National Forest Land Management Plan lists some migratory birds as Species of Special Interest, or Threatened and Endangered, or Sensitive Species.

These lists were reviewed with the "Birds of the Chugach National Forest". The following table describes the birds from the various lists that are of concern, and the habitats they can be found in. The following species could potentially occur in the project area.

**Table 7 Potential Migratory Bird Species**

| Species | Shrub Thickets | Hemlock Sitka Spruce forest | Mixed Deciduous spruce woodlands |
|---|---|---|---|
| Marbled Murrelet | X | XX | XX |
| Peregrine falcon | | X* | |
| Chestnut-backed chickadee | X | XX* | |
| Golden-crowned sparrow | XX* | | XX |
| Gray-cheeked thrush | X | X | XX* |
| Northern shrike | XX* | X | XX* |
| Northwestern crow* | | XX* | X |
| Rufous hummingbird | X | XX* | X |
| Varied Thrush | XX* | XX* | XX* |
| Northern goshawk | XX | XX | XX |
| Osprey (only during migration) | XX* | X | X |

Primary preference = XX; secondary preference = X; minor habitat preferences not indicated: *= breeding; #= probable breeding; += possible breeding

### Amphibians

Wood frogs may be present near the project area. It is unlikely to occur in the area to be restored. The project area lies within the wood frog's northern part of its range, it is mainly found in open grassy areas bordered by willow, aspen or spruce.

### *Environmental Consequences*

The project meets the purpose and need for recovery of wildlife habitat, is harmony with Forest Plan goals, and meets objectives for management of wildlife habitat, as stated in the Purpose and need in Chapter 1, Management of Fish and Wildlife Habitat.

## Issues

No significant or important issues related to wildlife or habitats were identified during public scoping or by the IDT. Varying degrees of effect will still occur due to different design features of the alternatives to wildlife and habitat. Alternatives may impact individual animals, but none are expected to affect populations or viability of any species.

**Design features that may have minor effects on wildlife or habitat are:**

*Miles of Stream Restoration:* Effects to wildlife habitat are beneficial in the long-term. Habitat quality will increase as vegetation composition and structural diversity increases. The more area restored, the greater the benefit to wildlife. With this comes greater potential short-term effects to individual animals due to the presence of humans and machinery, and the removal of vegetation.

*Interpretive panels and mining cabin*: Interpretive panels offer opportunities to educate the public about wildlife, habitat, and responsible use of public resources. This should have a positive effect on wildlife and habitat. The interpretive cabin, however, may draw more recreationists to the site. In general, the more human use in an area, the greater the potential to damage habitat and to disturb wildlife.

*Recreational gold panning* has the potential to degrade stream substrate composition, fish habitat, and bank vegetation and to potentially cause disturbance to wildlife. This can degrade habitat quality for species using bank vegetation for food or cover, species dependent on fish, and species nesting or breeding in the immediate vicinity. The less recreational gold panning, results in the less impact on wildlife and habitat.

*Construction of a Parking Area:* No change in effects from dispersed camping. Construction of a new parking area will remove some vegetation from available habitat. Ultimately this has a positive effect by reducing dispersed impacts from vehicles parked in the riparian area.

**Units of measure used to describe and compare relative effects on wildlife are:**

- Miles of stream restoration
- Presence of Interpretive Cabin.
- Occurrence of recreational gold panning.
- Construction of a parking area.

### Effects Common to Alternatives:

### Alternative design features having no effect on wildlife under all action alternatives.

*Bridges:* These will cause short-term disturbance and reduction of habitat quality, but the entire area will be disturbed during construction. These structures will be removed after work is complete. There is no difference between alternatives regarding effects to wildlife.

*Access and Road Construction & Reconstruction:* Generally, the more road construction, the greater the potential habitat loss due to vegetation removal and potential disturbance from vehicles and increased access. Road construction in this case does not offer new access to the public, only improved mining access to Palmer Creek. New vegetation disturbance will be minimal, as the primitive road is already in existence. Use of the road is not expected to change.

*Equipment Crossings:* No additional effect beyond temporary disturbance to habitat and wildlife already ongoing with restoration.

*Mechanical Manipulation and grading of tailings:* The more habitats restored the better for wildlife, regardless if it is private land or Forest Land.

*Restoration Costs have no effect on wildlife habitat:* Location of kiosk has no effect on wildlife or habitat. At this time there are no known nests or roosts of species near potential kiosk locations that would be affected.

*Resurrection Pass National Recreation Trail:* No substantial effect. Trail relocation is in same immediate area as existing trail. Vegetation is sparse and impacts of trail construction should be minimal in all action alternatives.

*Improvement of Resurrection Pass North Trailhead*: No effects on wildlife.

*Preliminary Cost of Implementation*: No effects on wildlife.

### Alternative 1 – No Action Alternative

*Direct and Indirect Effects*

**Miles of stream restoration:** The area currently is composed of 74% cottonwood and 26% Lutz spruce, with birch and hemlock making up only a fraction of a percent of the area. Stand structure is predominantly seedlings and saplings, and large trees are absent, except for a few large cottonwoods. With the relatively young age of existing trees, large snags and downed wood are also virtually absent. The habitat is best for species that use early successional stages, hardwoods, and riparian areas. Lack of downed woody material makes it less than optimal for many small mammals. Lack of snags reduces the habitat quality for cavity nesting birds and mammals, and raptors that use snags for nesting, roosting, or perching.

Indirect effects from no action are that habitat conditions will remain degraded, with minimal diversity of composition or structure. Habitat components such as large snags and logs will remain limited for years, as recruitment sources are absent. Without disturbance, conditions will change slowly. No direct effects

such as temporary disturbance from restoration work will occur, compared to action alternatives.

*TES Species:* There is no existing or potential habitat for threatened, endangered, sensitive or proposed species in the project area. Alternative 1 will have no positive or negative effects on these species.

*Management Indicator Species:* Management Indicator Species with existing or potential habitat in the project area are the moose and brown bear. There is limited browse for moose, which prefer early seral willow, birch and aspen. Salmon spawning habitat is also degraded, which reduces foraging habitat quality for brown bear.

*Species of Special Interest:* Species of Special Interest on the district are the gray wolf, lynx, river otter, marbled murrelet, Townsend's warbler, wolverine, bald eagle, and northern goshawk.

The project reach does not provide suitable habitat for species that require mature or old growth habitat for nesting or cover (such as marbled murrelet, Townsend's warbler, northern goshawk, or river otter). A few large cottonwoods are present which could provide nesting habitat for bald eagles. Degraded salmon habitat reduces foraging opportunities for bald eagles. Limited snags, downed logs, and cavities reduced foraging habitat quality for species such as the goshawk that depends on an abundance of bird and small mammal prey.

The area may be used for foraging by wolverines and wolves. These species may benefit from improving habitat quality for big game such as moose. Moose habitat is currently limited, reducing foraging habitat quality for these species. Lynx inhabit much of Alaska's forested terrain and use a variety of habitats, including spruce and hardwood forests, and both sub-alpine and successional communities. The best habitat occurs where there is a diversity of vegetation types with an abundance of early successional growth, which provides habitat for snowshoe hare and other small prey species. The area provides some early successional habitat, but lacks diversity of vegetation types. Although it may provide lynx foraging habitat, it is not likely optimal.

*Migratory Birds:* Habitat for migratory birds is optimal when there is a diversity of vegetation and structure to provide for their diverse foraging and nesting needs, and suitable snags available for cavity nesters. The area is very limited in all these components.

**Presence of Interpretive Cabin:** No mining cabin and interpretive program at the parking area will occur in this alternative. While public education is always a benefit, potential increases in visitor use if the mining cabin draws more people may also have impacts on wildlife and habitat over time. No action may reduce potential increases in visitation, but also does not benefit from educational opportunities compared to the action alternatives.

**Recreational gold panning** has the potential to degrade stream substrate composition, fish habitat, bank vegetation, and to potentially cause disturbance to wildlife. The less recreational gold panning, results in the less potential impact on

wildlife and habitat. Alternative 1 retains recreational gold panning in the project reach, and so increases potential impacts, similar to Alternative 3.

**Construction of a parking area:** Without action, vehicles continue to park in the riparian area on non-hardened sites, causing scattered impacts to vegetation and habitat.

*Cumulative Effects*

Cumulative effects include potential effects from the following projects:

Ongoing upgrade of the Resurrection Pass Trail: Upgrades maintain or improve trail condition and likely maintain or increase recreation user numbers over time as recreation increases on the district, and easy trail conditions allow for users of diverse abilities. Ongoing trail upgrades, and recreation use has the potential to impact vegetation and disturb wildlife, causing additional habitat degradation in the area.

Ongoing Hope Highway Fuels Reduction Project: Cumulative effects include short-term disturbance to wildlife and vegetation adjacent to the project area, but longer term benefit to habitat due to reduction of risk to the project reach from high intensity fire.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as above.

Ongoing Recreational Gold Panning*:* Ongoing recreational gold panning has the potential to continue to degrade riparian habitat and disturb wildlife.

### Alternative 2

*Indirect Effects*

**Miles of stream restoration:** 1.1 miles (Maximum Restoration)

Indirect effects of restoration include increase in habitat quality, as diversity of composition and structure, and numbers of snags and downed logs increase over time. The more area restored, the greater the benefit to wildlife. These alternatives cause greater short-term direct effects to individual animals however, due to disturbance from the restoration work, presence of humans and machinery, and removal of vegetation.

For wildlife, the desired condition is diversity of tree species, with a fairly equal distribution of size classes, an emphasis on retaining the largest hardwoods and conifers, and increasing hardwood and spruce regeneration. Increasing snags and downed logs to numbers closer to amounts in the reference reach is also desirable: 51-469 pieces downed wood/hectare and 0-79 snags/hectare (Bair et al. 2002). These numbers are currently high due to the spruce bark beetle. An ideal amount would be somewhere between minimums listed in the forest plan, and those found in the reference reach. This would provide ample habitat components, contribute to restoration needs, and provide plenty of components in case some are lost during flooding events.

Indirect effects are that restoration work will move toward this desired condition in the following ways. Restoration work will include removal of conifers and softwoods adjacent to the creek to use for bank stabilization and regeneration of cottonwood. Removal of trees in patches near birch stands can regenerate early seral birch, increasing the birch component and diversity of the project reach, while improving habitat quality for lynx, small mammals, birds, and moose. Removal of sod for bank restoration, offers an opportunity to create moose ponds, also improving habitat for moose. Improvement of moose habitat ultimately benefits wolves, bears, wolverines and other species that prey on moose or moose carrion.

Individual tree selection and thinning, while leaving many of the largest trees can reduce competition and enhance growth, promoting future nesting habitat or cover for bald eagles, goshawks, marbled murrelets, Townsend's warblers, and river otters. Removal of medium to large sized cottonwoods while leaving some of the small size classes (sizes 5" to 14.9" dbh) may assist in setting up an appropriate balance of stand structure over the long-term. Preserving areas of spruce or cottonwood seedling/sapling regeneration, where possible will also promote structural diversity. Promote growth of large trees will provide a future source of large snags and downed logs valuable to wildlife. Large snags, especially hardwoods, provide valuable sites for cavity nesting migratory and resident birds. In the short-term, creating or importing snags and downed logs during restoration will immediately improve habitat conditions (see mitigation).

Restoration of the stream channel will improve salmon spawning habitat, which will benefit species that feed on salmon such as black and brown bear, bald eagles, gulls, wolves, and other birds and mammals.

*Direct effects*

Direct effects include disturbance of wildlife that currently use the area for traveling, feeding, resting, or reproduction such as moose, bear, and migratory birds. In the short-term, removal of vegetation may provide temporary disturbance, and reduction of cover in foraging habitat for bears. Screened foraging habitat should be maintained during restoration to reduce encounters with hikers along the Resurrection Pass Trail if possible. Increasing riparian vegetation after restoration will enhance screened foraging habitat over time.

Disturbance due to restoration work may cause some animals to avoid the area altogether, or during periods of the day when work is ongoing. Removal of trees may destroy existing nests, roosts, cover, or foraging areas.

In summary, indirect effects include improved habitat quality over time and direct effects include temporary disturbance of individuals and habitat for MIS, Species of Special Interest, and Migratory Birds.

**Presence of Interpretive Cabin***:* Alternative 2 is the only alternative that develops a mining cabin and interpretive program at the parking area. While public education is always a benefit, potential increases in visitor use to the area if the mining cabin attracts more people, may also have impacts on wildlife and

habitat over time. These potential impacts may be greater with this Alternative than in Alternatives 1, 3, 4, 5, 6.

**Occurrence of recreational gold panning:** Recreational gold panning has the potential to degrade stream substrate composition, fish habitat, bank vegetation, and to potentially cause disturbance to wildlife. The reduced recreational gold panning would result in reduced potential impacts on wildlife and habitat. Alternative 2 does not allow recreational gold panning within the project area, so reduces these potential impacts compared to Alternatives 1 and 3, which retain current recreational gold panning in the project reach.

**Construction of a parking area:** Construction of a new parking area removes a small area from available habitat, but ultimately has a positive effect by reducing impacts to vegetation from vehicles parked in the riparian area on non-hardened sites. Alternative 2, 3, and 4 benefit habitat by providing a hardened site, and reducing scattered impacts over time.

*Cumulative Effects*

Ongoing upgrade of the Resurrection Pass Trail: Ongoing trail upgrades, and recreation use along the trail has the potential to impact vegetation and disturb wildlife in addition to restoration activities.

Ongoing Hope Highway Fuels Reduction Project: Same as Alternative 1.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as Alternative 1.

### Alternative 3

*Direct and Indirect Effects*

**Miles of stream restoration***:* Maximum Restoration on Public Lands: Amount of restoration on public lands and effects are the same as Alternative 2. No restoration would occur on the Haun Trust Lands.

**Presence of Interpretive Cabin:** Does not include a mining cabin, so no effect, as in Alternative 1.

**Occurrence of recreational gold panning:** Recreation mining continues in the project reach, so negative effects are the same as Alternative 1.

**Construction of a parking area:** Positive effects are the same as listed in Alternative 2

*Cumulative Effects*

Ongoing upgrade of the Resurrection Pass Trail: Effects are the same as listed in Alternative 2.

Ongoing Hope Highway Fuels Reduction Project*:* Same as Alternative 1.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as Alternative 1.

Ongoing Recreational Gold Panning: Ongoing recreational gold mining has the potential to continue to degrade riparian habitat and disturb wildlife species, as in Alternative 1.

### Alternative 4

*Direct and Indirect*

**Miles of stream restoration***:* Maximum restoration on public land. Amount of restoration on public lands and effects are the same as Alternative 2. No restoration would occur on the Haun Trust Lands.

**Presence of Interpretive Cabin:** No effect, as in Alternatives 1, 3, 4, 5, 6.

**Occurrence of recreational gold panning:** No recreational gold panning. Same as Alternative 2.

**Construction of a parking area:** Same as Alternative 2.

*Cumulative Effects*

Ongoing upgrade of the Resurrection Pass Trail: Same as Alternative 2

Ongoing Hope Highway Fuels Reduction Project: Same as Alternative 1.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as Alternative 1.

### Alternative 5

*Direct and Indirect Effects*

**Miles of stream restoration:** Medium restoration: Restoration is greater than Alternative 6 and 1, but less than all other alternatives. This alternative provides less long-term habitat improvement, but less short-term impacts than all action alternatives except Alternative 6.

**Presence of Interpretive Cabin:** No effects, as Alternative 1, 3, 4, 5, 6.

**Occurrence of recreational gold panning:** No recreational gold panning. Effects are the same as Alternative 2.

**Construction of a parking area:** No parking area, so no positive benefits. Same as Alternative 1.

*Cumulative Effects*

Ongoing upgrade of the Resurrection Pass Trail: Same as Alternative 2

Ongoing Hope Highway Fuels Reduction Project: Same as Alternative 1.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as Alternative 1.

### Alternative 6

*Direct and Indirect Effects*

**Miles of stream restoration:** Minimum restoration: Restoration is greater than Alternative 5 and 1, but less than all other alternatives. This alternative provides less long-term habitat improvement, but less short-term impacts than all action alternatives except Alternative 5.

**Presence of Interpretive Cabin:** No effects, as Alternative 1, 3, 4, 5, 6.

**Occurrence of recreational gold panning:** No recreational gold panning. Effects are the same as Alternative 2.

**Construction of a parking area:** Same as Alternative 1.

*Cumulative Effects*

Ongoing upgrade of the Resurrection Pass Trail: Same as Alternative 2

Ongoing Hope Highway Fuels Reduction Project: Same as Alternative 1.

Ongoing Palmer Creek Road Fuels Reduction Project: Same as Alternative 1.

### Summary of Effects to Wildlife by Alternative

Alternatives 2, 3, and 4 offer the greatest habitat improvement for wildlife due to the greatest amount of restoration. Alternative 3 allows potential impacts to habitat and disturbance to individual animals to continue with recreational gold panning. Alternative 2 also may increase visitation by drawing people to see the mining cabin. This may also cause cumulative effects to habitat and wildlife over time. All three alternatives offer benefits from a hardened parking area. Alternative 4 likely offers the most benefit and least impacts to wildlife and habitat of all alternatives.

Alternative 1 allows wildlife habitat to continue to degrade, does not offer educational opportunities, and continues to allow impacts from recreational gold panning and vehicles parking in the riparian area. Overall, this is the least beneficial alternative for wildlife.

Ultimately, none of the alternatives, including Alternative 1 will substantially impact threatened, endangered, proposed, or sensitive species, nor will they impact populations or viability of management indicator species, species of special interest, or any other wildlife species. The project reach is only a small area within a 1 million acre USFS Ranger District. Like a “needle in the haystack”, on a larger scale, restoration activities will have minimal effect on wildlife.

# Social Environment

## Heritage Resources

### *Affected Environment*

Resurrection Creek is located on the north end of the Kenai Peninsula within the Southcentral Alaska, and is a major drainage in the Kenai Mountains that flows from south to north into Turnagain Arm near the former mining town of Hope.

Humans have used Resurrection Creek spanning a period of about 10,000 years. The cultural resources in and near the project area include prehistoric and historic remains. Some of these properties are on, or eligible for the National Register of Historic Places. The historic mining resources constitute the greater part of the known cultural resources in and near the project area, although large portions of the project area have yet to be inventoried. The National Historic Preservation Act (Section 106) and Executive Order 11593 require archaeological inventory to be completed prior to implementation of any undertaking. Prior to the late 1990s, however, funding for completing heritage reports was often not provided. Therefore some information gathered from surveys completed in the past 20 years has not been reported. The majority of the cultural resources currently identified within the watershed remain formally unevaluated for the National Register of Historic Places (NRHP). Only Hope Historical District (SEW-00018) has been evaluated and placed on the NRHP.

Through research of previously written books and reports completed in ecologically similar areas, it is possible to infer the early cultural use of Resurrection Creek. Artifacts from every period of human occupation have been discovered in the region. The earliest known site in the Cook Inlet area is located at Beluga Point on the north side of Turnagain Arm. This site contained Paleo-Arctic core and blade technology. Use of the area was probably due to the abundance of sheep, caribou and fish (Reger 1998). Artifacts from the Middle Holocene have been found along the Kenai River in the interior of the Kenai Peninsula. In addition, a large number of sites from the late prehistoric period (after about 1,000 years ago) have been located throughout the region. Prehistoric period sites are characterized by rectangular house depressions, other pit features, and a preponderance of cobble spall scrapers, but few other preserved artifacts. Archaeological evidence suggests that Athapaskans occupied the region around Cook Inlet beginning about 700 years ago, and thus, sites dating from the late prehistoric period are presumed to relate to Tanaina Athapaskan occupation (Reger 1998).

Earliest known Euro-Americans to visit the Cook Inlet region were English explorers. Captain James Cook sailed into the inlet in 1778. In the 1790's Russian fur traders began setting up posts on Cook Inlet to develop the fur trade. While the primary focus of Russian activity was the fur trade, the Russians prospected the surrounding area for gold. Euro-American influence had little impact on the Turnagain Arm area until the first gold discovery there in 1890. In 1893 prospectors staked the first mining claims in the area and established mining camps at the mouths of the Resurrection and Sixmile creeks in 1895.

During 1895, prospectors fanned out through the Turnagain Arm area looking for additional sources of gold. Sam Mills and J.T. Ballam filed the first claims on Canyon Creek, a tributary of Sixmile Creek, the next major drainage east of Resurrection Creek. Other prospectors filed claims on Sixmile, Canyon, East Fork, Mills, and Lynx creeks. Gold discoveries on Canyon and Mills creeks produced the richest returns, setting off a stampede of outside prospectors to Turnagain Arm the following year. In 1896 about 1,500 men and women worked the Sixmile drainage, establishing the Sunrise Mining District (Moffit 1906:9; Barry 1997:54). As pressure on the resources grew, people began settling wherever suitable land for dwellings could be located. The project area is within the current boundaries of the Hope Historical Mining District.

The northern part of the Kenai Peninsula contains commodities of gold, silver, copper. Mining has included significant placer gold production, over 100,000 ounces from 1895 to present. Lode production includes a small amount of gold, about 13,500 ounces prior to World War II. Mining came to a halt in the early 1940s with the Preference Rating Order of 1941, and the Limitation Order L-208 of 1942 (Barry 1997:210). Although L-208 was revoked July 1, 1945, mining never recovered its pre-war economic importance. The early twentieth century is considered a key period of historic significance for Resurrection Creek, to which the majority of the historic mining remains are linked.

### Current Conditions

Forest Service management of cultural resources is legislated by Acts of Congress and Executive Orders. They mandate inventories of cultural resources, and preservation and interpretation of all types of cultural resources for the benefit of the public. The requirements of three of these, plus a Programmatic Agreement between Region 10 of the Forest Service, the State Historic Preservation Officer and the Advisory Council on Historic Preservation, are summarized in Appendix A.

Of the 111,734 acres that comprise the total area of the Resurrection Creek Watershed, about 2,372 acres, or about 2% of the total area has been surveyed for cultural features (CNF Heritage Program files). These surveys have been project related and so are discontinuous in nature with a rather checkerboard appearance when plotted on a map. Maps of archaeological surveys completed after 1992 are not provided due to the lack of funding allocated to update the GIS layers. The GIS map completed to date would show less than half of the areas actually surveyed.

No Alaskan Native related sites are known to be located along Resurrection Creek. It is likely that Alaska Native sites are in the vicinity of the project area, however, historic mining may have destroyed many such sites, and the lack of intensive surveys served to provide little new information about site locations.

Forty mining and Euro-American historic properties are currently documented within the watershed. Of these sites, only one is within the proposed project area. This site has been properly documented and is being evaluated for

eligibility for inclusion on the National Register of Historic Places, this evaluation must occur before implementation of this project.

Another type of heritage site that needs to be addressed here are cultural landscapes. Cultural Landscapes are a type of historic property addressed in the Secretary of the Interior's Standards and Guidelines, as revised in 1992. A cultural landscape is defined as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values: (Birnhaum 1994:1). Cultural landscapes generally fall into one of four categories: historic designed landscapes, historic vernacular landscapes, historic site landscapes, or ethnographic landscapes. The size of cultural landscapes can vary from as little as half an acre to hundreds of acres.

Although "Most historic properties have a cultural landscape component that is integral to the significance of the resource" (Birnhaum 1994:2), the cultural landscape elements have not been fully inventoried or evaluated for any of the historic properties in the Resurrection Creek watershed. Mining landscapes fall under the category of historic vernacular landscape, "a landscape that evolved through use by the people whose activities or occupancy shaped the landscape" (Birnhaum 1994:2).

The project area can be classified as a vernacular landscape. The historic period with which most of the cultural landscapes in the watershed are associated is the early 20th century. The features that contribute to the historic character of the cultural landscape include the physical environment and ecological systems of the region, views and vistas, mining areas, living areas, patterns of land division, vegetation and associated changes, tailing piles, ponds and ditches, the historic cabins and outbuildings, trails and roads, and indigenous and introduced vegetation.

### Description of reference conditions

Three reference condition periods exist for the Sixmile/Canyon Creek Watershed: the pre-European fur trade period (prehistoric); the Euro-American fur trade period, which directly impacted the wildlife of the Kenai Peninsula, and indirectly affected its vegetation; and the American mining period/early Chugach Forest period (1888-1942), during which human use changed some drainage patterns, and resulted in changes to botanical and biological resources.

During the pre-contact period (pre-A.D. 1778) Alaskan Natives used biological and botanical resources for food, clothing, shelter and transportation. Although the biological and botanical populations and their distribution as recorded at the time of European contact are often viewed as representative of a "pristine" state, these populations are simply indicative of their state given the technology of the human groups that harvested them, and the population size of those human groups at that time. In fact these populations were effected greatly by early human populations through the use of fire, and by hunting and gathering.

During the “Fur trade period” of A.D. 1778 to 1888 Alaska Natives and non-Natives increased harvest of land mammals, such as beaver, land otter, marmot, fox, lynx, caribou, sheep, wolf, bear and wolverine. A decrease in numbers of beavers would have had an impact on the vegetation and the hydrology of Resurrection Creek.

Documentation from other parts of the Kenai Peninsula shows people catching anadromous fish to sell to Euro-American settlers. If this was an economic strategy of the Native Alaskans of Resurrection Creek, such activities may have had a detrimental effect on Resurrection Creek fish populations. Decreases in populations of fur bearers and related changes in human socialization patterns may have caused changes in human settlement patterns in the Resurrection Valley, as is apparent in other parts of the Kenai Peninsula. These would be evident in the locations and types of sites from particular time periods.

The American mining period/early Chugach National Forest period (1888-1942) is one of the best-documented historic eras. Mining camps were established in proximity to streams, whose water was used for placer and hydraulic mining. The location of mineral veins was a concern for later hard-rock mines, which were established away from major streams. Mining related machinery was brought in, and buildings, ditches, and roads were constructed. Early 20th century photos of the areas adjacent to Resurrection Creek show widespread clear-cut areas throughout the valley as late as the 1930s. Populations of fish and land mammals likely continued to decrease as a result of human subsistence use and changes to the Resurrection Creek streambed.

### *Environmental Consequences*

Hope, Alaska is located in the Hope Historical Mining District, which is on the National Register of Historic Places. Historical mining is the single most important defining characteristic of this community. No single place in the Hope area better exemplifies this sense of history than Resurrection Creek. Mining on this creek has left a visual record in the form of tailings and scattered artifacts. Several Hope residents have expressed a valid concern about losing part of this history through implementation of the Resurrection Creek Stream and Riparian Restoration Project. Of particular concern is the potential decrease in archaeo-tourism related to the loss of easily accessible, visual mining history.

#### *Significant Issue*

The mining history of the area contributes to the sense of place of the Hope community. Hope residents have expressed concerns about losing the mining character through implementation of the project. Some are concerned about a potential decrease in tourism.

*Indicator:*

Miles of tailings destroyed as a result of project implementation.

*Cumulative Effects*

Projects such as the Mineral Plan of Operation on Bear Creek do add to the cumulative effects of this project. The Plan of Operation includes the removal of tailings piles along Bear Creek and other streams and tributaries. Multiple projects add to the cumulative effect of losing a large number of the historic tailings piles on the Forest. In short, all action alternatives involve the loss of a mile or less of tailings along Resurrection Creek. This has the cumulative effect of significantly reducing the total number of historic tailings on the Forest when combined with tailings losses resulting from other Forest projects.

### Alternative 1- No Action Alternative

Effects of this alternative to heritage resources and the community's sense of history will be minimal. Due to the relative stability of tailings piles in the project area it is expected that there will be little direct effects, either positive or negative, if they are left in place. However, some indirect negative effects may occur. These indirect negative effects may occur in the form of tailings being moved for recreational gold panning and relic hunting, both of which are difficult to patrol and monitor. There is expected to be little to no cumulative effects as a result of this alternative.

### Alternative 2- Proposed Action

*Direct and Indirect Effects*

There are direct negative effects to heritage resources and the community's sense of history as a result of this alternative. The restoration of 1.1 miles of Resurrection Creek equates to a 1.1 mile loss of tailings, as well as scattered surface, and potential sub-surface artifacts, which are a physical and visual history of Hope's mining past. In addition, indirect negative effects may occur in the form of lost revenue for the community from a reduction in archaeo-tourism.- The reduction of recreational gold panning in the project area may also have the indirect effect of concentrating recreational miners elsewhere, potentially increasing damage and looting of heritage resources located outside the project area.

Though there are both direct and indirect effects of this alternative, not all are negative. Development of interpretive panels and exhibits will not only have the direct effect of increasing archaeo-tourism and exhibiting the community's history, they will have the indirect effect of educating the public as to the value of the heritage resources, thus protecting sites from looting and collecting outside of the project area.

### Alternative 3

The effects of Alternative 3 are the same as alternative 2 with the exception of 0.2 miles less of restoration.

### Alternative 4

The effects of Alternative 4 are the same as that of Alternative 2 and 3.

### Alternative 5

Positive direct effects as a result of this alternative would be the same as alternatives 2, 3 and 4. Direct negative effects as a result of this alternative would be reduced in comparison to alternatives 2, 3 and 4; since this alternative would restores 0.6 miles of Resurrection Creek. This equates to a 0.6 mile loss of tailings, as well as scattered surface and potential sub-surface artifacts, which are a physical and visual history of Hope's mining past.

### Alternative 6

Effects resulting from this alternative would be very similar to those of alternative 5. The minor difference is the slightly smaller proposed restoration area of 0.5 miles. Over all a decrease of .1 mile of creek restoration will decrease negative effects only slightly.

## Recreation

### *Affected Environment*

The project area for the Resurrection Creek Stream and Riparian Restoration project is located approximately five miles south of Hope on Resurrection Creek. The project area is upstream of the Resurrection Pass North Trailhead. The Resurrection Pass National Recreation Trail bisects the project area and generally parallels Resurrection Creek for approximately one mile.

The primary recreation activity in the project area is use of the Resurrection Pass National Recreation Trail. By definition, National Recreation Trails represent the more outstanding trail opportunities of the Forest Development Trail System, offer extended trail experiences reasonably close to population centers, and possess significant natural and cultural features. The scenic features along the trail include alpine meadows, mountain lakes, and Juneau Falls. Cultural features include remnants of the mining and trapping era. The Resurrection Pass Trail was designated a National Recreation Trail in 1979.

The Resurrection Pass Trail is nationally recognized for mountain biking opportunities as well as hiking. The 38.8 mile long trail is used year round for non-motorized activities including hiking, biking, x-c skiing, and horseback riding. The north trailhead is located approximately ¾ mile downstream of the project area. From December 1 to February 15 each year, the trail is open to

snowmobile use. It is open to horse and bicycle use from July 1 to March 31. Detailed use numbers have been collected in the last few years as part of the on-going Resurrection Pass Carrying Capacity Study.

The Resurrection Pass Trail passes through private property before reaching the project area. The Forest Service has a 100-foot wide easement through the private property and currently manages the easement as a trail. One small privately owned cabin plus part of a footbridge lie within the easement. Past activities on the trail such as vehicle access for mining or timber harvest activities give the trail a “road” appearance, particularly on the first two miles. Tailings piles are readily apparent from the trail. Resurrection Pass Trail is currently undergoing extensive reconstruction, primarily on the north end of Resurrection Pass and on the Devils Pass Trail.

### General Use Trends for the North end of Resurrection Pass Trail

*Types of Use*

| | |
|---|---|
| 95% public use | 5% outfitter use (artificially low due to moratorium on issuing new permits for commercial use) |

*Duration of Activities*

| | |
|---|---|
| 60% multiple day trips | 40% day use trips |

*Time of Use*

| | |
|---|---|
| 39% weekend use | 61% weekday use |

*Types of Activities*

| | | |
|---|---|---|
| 80% hiking | 13% biking | 7% other uses (horse, hunting, gold panning) |

Source: data collected in 2000, 2001, and 2002

### Public Use Cabins

Nine public use cabins are accessed by the Resurrection Pass Trail with one cabin generally available only by floatplane or snowmobile. Reservations can be made six months in advance through the National Recreation Reservation Service. Cabin fees are $35 to $45 per night. Cabin occupancy is based on the number of reservations made each year. In general, cabins on the Resurrection Pass Trail are fully occupied throughout the summer and winter reservations are primarily on the weekends. Other incidental use occurs but is considered trespass. The high use season for the Resurrection Pass cabins is generally late May to the end of September.

## Recreational Gold Panning

The Chugach National Forest has a long history of placer gold mining on the Kenai Peninsula. Currently gold panning, sluicing, and dredging for non-commercial purposes are important outdoor activities on the Forest as indicated by the number of participants, investment in equipment and supplies, impact on local economies, and the frequency of this type of activity.

The project area is part of the "acquired lands" property known as the Old St. Louis Claims. Acquired lands are not subject to the 1872 mining laws since they are not open to mineral entry. This means that mining claims cannot be located on these lands. There is no authority that allows the public to take valuable mineral deposits from lands withdrawn from mineral entry or acquired lands. The key words here are "valuable mineral deposits". The disposal of "valuable mineral deposits" from withdrawn or acquired lands can only be accomplished through leasing or permitting. Recovering small amounts of gold "Recreational gold panning" is allowed under the authorities designated to the Forest Service. Recreational gold panning includes panning, sluicing, and suction dredging with a four-inch or smaller diameter hose. The operating plan for recreation gold mining areas for the Forest was completed in 1996.

### Use of the Recreation Mining Area downstream of the Private Property

- 1500 people a month use the area during the summer
- July is the heaviest use period with up to 92 people per day
- 60% have little to no experience
- 30% are members of an organized prospectors club
- 100% use gold pans
- 50% use metal detectors
- 30% use sluice boxes
- 5% use suction dredges
- 45% obtained their information from Alaska residents
- 25% obtained information from prospectors' club publications
- 20% obtained information from Hope businesses
- 10% obtained information from the Forest Service

Source: Data gathered by site host throughout the summer of 1996.

Monitoring and data collection on the recreation gold panning that takes place upstream of the private property (or lower end of the project area) has not been done. Road access is limited and hobbyists and newcomers generally remain in the designated recreational gold panning area.

### Dispersed Camping

Other recreation activities in the project area include dispersed camping, which is usually associated with the recreational gold panning activities. Specific use figures have not been collected on dispersed use. The designated recreation gold panning area between the private property and the trailhead offers road accessible dispersed camping. The only site amenity is a vault toilet.

### Resurrection Pass Trail

The Resurrection Pass Trail passes through private property before reaching the project area. The Forest Service has a 100-foot wide easement through the private property and currently manages the easement as a trail. One small privately owned cabin plus part of a footbridge exist on the easement. Past activities on the trail such as vehicle access for mining or timber harvest activities give the trail a “road” appearance, particularly on the first two miles. Tailings piles are readily apparent from the trail.

Resurrection Pass Trail is currently undergoing extensive reconstruction, primarily on the north end of Resurrection Pass and on the Devils Pass Trail. This multi-year, approximately one million dollar project began in 2000 and should be completed by 2005. Force account crews are accomplishing the work with a trail dozer, excavator, ATVs, and hand tools. The primary elements of the project include: Tread work, slope stabilization, ditching, new and/or replacement drainage structures, reroutes as necessary, and Bridge replacements as necessary.

Two cabins on the Resurrection Pass Trail are scheduled for replacement in 2005. Devils Pass Cabin and Romig Cabin would be taken off the reservation system during construction.

Tailing piles on the right are proposed to be graded to recover floodplain width and elevation.

**Figure 9 Typical section of the Resurrection Pass Trail in the project area.**

## Scenic Resources

The lands within the project area have been subject to manipulation for the last century. In most areas viewed from the Resurrection Pass National Recreation Trail, the existing landscape character meets the Forest Plan Standard of a low scenic integrity level. These landscapes appear moderately altered to Forest visitors. There are places along the streambank within the project area that appear heavily altered from the past mining activities. This includes the presence of large mining tailings devoid of vegetation, and the unnatural floodplain of the creek. These areas have a very low scenic integrity, since they strongly dominate the landscape character. However, at the same time the dominant mining tailings paint a picture of the mining culture that provides a sense of place to the community of Hope.

**Figure 10 View from the trail near the upper end of the project area**

## Sport Fishing

The Alaska Department of Fish and Game (ADF&G) is responsible for regulating fishing on National Forest lands. According to the ADF&G website, Resurrection Creek is currently open to sport fishing for King Salmon less than 20” long, other salmon of all sizes, rainbow/steelhead trout, arctic char/Dolly Varden, grayling, lake trout and other finfish (ADF&G 2004). The ADF&G has a closure on king (chinook) salmon greater than 20” long due to the small population size (refer to hydrology report). The decision to allow fishing for king (chinook) could only be made after population evaluation by the ADF&G-Sport fish Division.

Currently sport fishing for pink salmon mainly occurs at the mouth of Resurrection Creek. More and more anglers are discovering the pink salmon fishing between the mouth and the Hope highway bridge. Approximately 20 anglers can be seen fishing within a ½ mile of the highway bridge on any given day. A handful of locals have been known to fish the section between the highway bridge and the foot bridge on Resurrection Trail (Johansen 2004).

### *Environmental Consequences*

Recreation resources have been analyzed for the Forest lands within the project area. The range of Recreational Opportunity Spectrum (ROS) classes will remain as a range of semi-primitive non-motorized (SPNM) to roaded modified (RM). The analysis area used for recreation is the Resurrection Creek drainage. This project will meet the Recreation Opportunity Spectrum classes prescribed in the Revised Land and Resource Management Plan for the Chugach National Forest, if mitigation measures and forest plan direction described in this report are implemented.

**The following significant issue was identified based on public comment:**

**Recreational gold panning** – recreational gold panning has the potential to damage/erode the channel after reconstruction is complete. There is a concern that closing recreational gold panning south (upstream) of private lands will adversely affect mining tourism in the Hope area.

*Indicator:*

Number of miles open and useable terrain for recreational gold panning in each alternative within the project area.

Other recreation issues that will be addressed in this analysis include a qualitative assessment of impacts from implementation of restoration activities on:

- Recreational gold panning
- Dispersed camping
- Resurrection Pass National Recreation Trail (RPNRT) use
- Scenic Resources
- Sport fishing

*Cumulative Effects*

The cumulative effects analysis area for this resource is the Resurrection Creek drainage from the project area to the mouth of Resurrection Creek in the town of Hope, including both National Forest System lands and those under other ownership. The recreation use in this drainage is moderate compared to the rest of the district. Cumulative effects to recreational resources will be evaluated based on changes in recreational usage (increases vs. decreases in use levels and shifts in types of use).

The past, present and reasonable foreseeable actions that may effect recreation in the Project Area are:

1. The RPNRT is in the process of being reconstructed. The project began in 2000 and will be completed in 2005.

2. Ongoing fuels reduction work along the Hope Highway. This occurs in a different drainage but recreational users utilize the highway for access to the Resurrection Creek drainage.

3. Ongoing fuels reduction work along the Palmer Creek Road. This road intersects the Resurrection Creek Road approximately three miles north of the project area and is within the same drainage.

4. JD Hahn (mining claim holder) has applied for a mineral lease on the land to the east of the Haun Trust land. If BLM approves the lease, and if FS concurs with that decision, JD will need access and has expressed interest in using the new road, if one is built. In that case, he would install a miner's gate, possibly near the north boundary of the Haun Trust land.

5. The Seward Ranger District plans on reconstructing the Devils Pass and Romig public use cabins in 2005. The cabins will be closed to public use during the reconstruction.

6. Porcupine Campground including the Gull Rock Trailhead is scheduled for reconstruction in 2006, depending on funding.

### Alternative 1 – No Action Alternative

*Direct and Indirect Effects*

#### Recreational Gold Panning

Under Alternative 1, recreational gold panning would continue along 1.76 miles of Resurrection and Palmer Creeks as shown on Alternative 1 Map. The existing areas open to recreational gold panning use meet most users' expectations.

Under the no action alternative there would be no direct effects to the recreational gold panning program in the Resurrection Creek area.

The indirect effects of allowing gold panning in the area will be the continued illegal panning (using suction dredges and other excavating equipment) occurring on the river banks above the active stream channel along Resurrection and Palmer Creeks. Recreational gold panning is allowed only within the active

stream channel. This is a continuing Law Enforcement issue, which is difficult to enforce especially south of private lands because of the inaccessible nature of the area.

### Other Recreational Activities

There will be no direct effects to dispersed campers, RPNRT users, sportfishing anglers, hunters, etc., as the result of the no action alternative.

An indirect effect of the no action alternative will be that RPNRT users will continue to view an unnatural landscape caused by past mining activities (channelized stream, mounds of mine tailings and declining riparian habitat) within approximately the first two miles of the RPNRT.

### Direct and Indirect Effects common to the Action Alternatives

### All Recreational Users

Increased traffic, dust, noise, smell, visual distraction, water turbidity, construction equipment, and safety concerns associated with stream restoration activities could have short-term direct effects on recreation users (recreational gold panners, dispersed campers, RPNRT users, sportfishing anglers, outfitter/guide permittees, hunters, etc.).

Machinery operating within the river channel could cause short-term indirect effects to recreationists using the RPNRT with horses, llamas, dogs, etc... 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 (listed above) to other drainages on the Forest during implementation of the restoration project.

An indirect effect of stream restoration is the potential for an increase in salmon populations that would potentially attract more bears to the area than there are now.

### Recreational Gold Panning

An indirect effect of the action alternatives is the potential that recreational panners will be attracted to the restored stream channels, despite the closure order, because the newly excavated and disturbed mine tailings may expose buried gold flakes.

### Scenic Resources

All action alternatives would restore a portion of Resurrection Creek to its natural landscape characteristics. In order to accomplish this, the existing vegetation would be cut and used to construct the new floodplain and associated features.

The existing channel would be restored to a natural floodplain. This will have a direct effect on scenic resources. The existing vegetation is a positive element of the landscape. Removal of much of the vegetation is a short-term direct effect on scenic resources. Once the desired condition has been met for restoration, the new vegetation and establishment of a natural appearing floodplain would meet the Forest Plan direction for scenic resources.

### Sport Fishing

As a result of increased water turbidity caused from restoration activities within Resurrection and Palmer Creeks, all action alternatives will result in the short-term indirect effect of decreased fishing quality from the project area down to the mouth of Resurrection Creek at Turnagain Arm. Turbidity plumes would not occur during any salmon fishing periods, so would just potentially affect fishing for resident species (mostly Dolly Varden). The worst case scenario would be under Alternative 2, expected to generate six to eight high turbidity events over a two year period. Turbidity plumes created during channel connections on previous projects within Resurrection Creek lasted up to 45 minutes before returning to ambient conditions. Refer to the Aquatic and Hydrology Resource Analysis in this chapter for additional information. Anglers that fish the mouth of Resurrection Creek to the Hope Highway bridge (nominal fishing use has been observed south of the bridge to the project area) may be temporarily displaced from fishing during water diversions as new channel segments are first connected to the flows of main stem Resurrection Creek.

A long-term indirect effect of restoration is the improvement of fisheries habitat for pink, chinook and coho salmon and the potential for these species to become established in Resurrection Creek. It is expected that only a moderate return of chinook and coho salmon could occur as a result of this restoration project. It is unlikely that fishing for these species will increase from present day levels. Resurrection Creek currently has a well-established pink salmon run (refer to Hydrology and Aquatic Species analysis in this chapter for more details). Restoration efforts have the potential to increase the pink salmon population by no more than 5% (Johansen, 2004).

As the moderate levels of fisheries become established (as described above) in Resurrection Creek, another indirect effect of restoration will be the potential to increase the number of anglers fishing Resurrection Creek. Though the number of sport fishing anglers that could be attracted is expected to be low, other rivers on the Kenai Peninsula may be a good indicator of how much angler use is increasing each year. The Russian River located on the Kenai Peninsula off of Sterling Highway has experienced approximately 6% increase in visitors per year since 1998 (Johansen, 2004). Due to the remote location of Resurrection Creek and the dirt road access it is unlikely that this 6% increase will be realized in the Resurrection Creek drainage.

### Cumulative Effects common to all action alternatives

The ongoing Hope Highway and Palmer Creek fuels reduction projects are expected to be complete in 2006.

The future Hope Highway and Resurrection Creek Road reconstruction projects along with the fuels reduction projects have the potential of increasing the amount of construction traffic along the Hope Highway and portions of the Resurrection Creek Road. The construction traffic would create the short-term direct effects of increased highway traffic, noise and smells from machinery along the aforementioned roads. These effects combined with the short-term effects described under all action alternatives would directly affect recreational users who access the project area from these roads. Upon completion of all these projects, these effects would subside. Refer to the social and economics section of this chapter for additional information.

Developed recreation improvement projects are planned for RPNRT, public use cabins, Porcupine Campground, Gull Rock Trailhead and Hope Point Trail spanning a 6-year period. An indirect effect of these projects is the potential to displace some campers and trail users during construction.

The sustained yearly effects of all projects in the Resurrection Creek Road corridor to Hope have the potential to displace some recreationists to other areas on the Chugach Forest. This displacement of recreational users may increase pressure on trails, campgrounds, streams and public use cabins in other areas.

### Alternative 2– Proposed Action

*Direct and Indirect Effects*

### Recreational Gold Panning

Under Alternative 2 approximately 0.48 miles of stream will be open to gold panning and 1.28 miles would be closed. The remaining areas open to recreational gold panning use would meet most users' expectations though some users will be displaced.

A long-term direct effect of Alternative 2 would be closing 1.28 miles of Resurrection and Palmer Creeks to recreational gold panning. A handful of local residents and members of organized prospector clubs mainly utilize this area. Use is considered to be low since little gold has been found in the area and non-motorized access means that recreational panners have to walk approximately a mile while carrying excavating equipment (gold pans, sluice boxes, suction dredges, shovels, etc.). The majority of recreational gold panning comes from hobbyists and newcomers (tourists) who generally remain in the designated area between the North Trailhead and the Haun Trust Lands. The closure order would also consolidate recreational gold panning use to an easily accessible area making enforcement of regulations more probable. The effects of prohibiting gold panning would be reduced by providing interpretive displays, creating an interpretive historic mining cabin, and revising the gold panning brochure to encourage gold panning in the designated areas north of the Haun

Trust Lands. Interpretation will focus on historic mining, how and where to gold pan, a description of the stream restoration process and how a restored river will improve the riparian habitat of Resurrection Creek.

An indirect effect of Alternative 2 would displace gold panners to other designated panning areas potentially increasing crowding, pressure and resource damage in these areas. In addition, there would be the potential for permanent displacement of recreational gold panners from the Resurrection Creek drainage. Some users may become frustrated with the Forest closing any area to gold panning.

Another indirect effect of Alternative 2 would be the difficulty of protecting and maintaining the interpretive mining cabin on National Forest lands. The Seward Ranger District has a high vandalism rate on similar type structures or developed sites that are located along roads in remote locations. Most likely the cabin would be vandalized and trespass would occur during the winter months. To prevent vandalism and trespass the cabin would have to be removed after the summer months. Repairing the damage caused by vandals and moving the cabin off-site on a yearly basis could be costly.

### Dispersed Camping

Most dispersed campers that utilize the banks of Resurrection Creek in the project area are recreational gold panners. A direct effect of Alternative 2 would be that campers would no longer be able to drive to the rivers edge and set up camp. They will have to park in the new parking area and carry their equipment (tents, stoves, panning equipment, etc.) to the camping/panning area next to the river. Dispersed campers with RVs or trailers would also be allowed to camp in the parking area.

An indirect effect of this alternative is some campers may get frustrated with the new restrictions and perceived inconvenience and decide to go to an area that allows them closer access to a river. Or, they might camp at the existing dispersed camp site regardless of the closure. Future levels of funding for patrolling the area are unknown, and if they remain low, some camping may still occur. The new parking area would accommodate more vehicles than is presently available, which could increase day and overnight use in the area.

### Resurrection Pass National Recreation Trail

A direct effect would be the increased emphasis on educating the public through interpretation. Three interpretive signs would be placed along the trail to explain the benefits of the restoration project, the mining history in the area and how and where to recreational gold pan without causing excessive resource damage.

#### *Cumulative Effects*

Under Alternative 2 there would be no additional cumulative effects.

## Alternative 3

*Direct and Indirect Effects*

### Recreational Gold Panning

Under Alternative 3, recreational gold panning will be allowed throughout the project area upon project completion. Approximately 3.15 miles of stream will be open to gold panning, which is an increase of 1.39 miles of water surface area from the existing condition. The restoration project will increase the sinuosity of the Resurrection and Palmer Creeks and add a number of side channels and pond areas, which increases stream length and water surface area. The additional number of miles of river open to recreational gold panning will exceed most users' expectations and has the potential to increase the number of recreational panners in the project area.

Under Alternative 3, a short-term direct effect would be the closure of the project area to recreational gold panning through the duration of the restoration project. Upon project completion, gold panning would be allowed in the entire project area. This alternative may attract more recreational gold panning use to the area due to the increased miles of active stream channel available and the disturbance to the mine tailings.

A long-term direct effect of Alternative 3 will be an increase in the available stream length and water surface area open to recreational gold panning. Under the recreational gold panning regulations all materials within designated active stream channels can to be panned with a 4-inch suction dredge, sluice boxes, gold pans, etc.

The interpretive mining cabin would not be built on National Forest lands. Instead, a cooperative agreement with the town of Hope may be developed to create an interpretive mining program. The interpretive program would provide tourists with a better understanding of historical mining in and around the town of Hope. In addition, the program would show how and where to gold pan with the least amount of impact on the riparian resource.

### Dispersed Camping

Most dispersed campers that utilize the banks of Resurrection Creek in the project area are recreational gold panners. A direct effect of Alternative 3 would be that campers would no longer be able to drive or camp next to the rivers edge. The camping and parking area would be moved to the east side of Resurrection Creek Road. The existing dispersed camping site next to the river would be closed to vehicle and overnight use.

An indirect effect of this alternative is the displacement of some long time riverside campers. Some campers may get frustrated with the new restrictions and perceived inconvenience and decide to go to an area that allows them closer access to a river. The new parking area would accommodate more vehicles than presently available, which could increase day and overnight use in the area.

### Resurrection Pass National Recreation Trail

Under Alternative 3 the RPNRT users would be less impacted by the restoration project than Alternative 2, since the trail would not be used for access to the project area and the river would not be rerouted into the trail.

A long-term beneficial direct effect to trail users would be that the Resurrection Pass North Trailhead would be rebuilt. Trail users would benefit from an enlarged parking area and a new crushed aggregate surfacing. The signs, wheel stops and parking barriers would be replaced when funding becomes available.

Another direct effect would be the increased emphasis on educating the publics through interpretation. One interpretive sign would be placed along the RPNRT and an interpretive kiosk would be placed at the new parking area. The interpretive panels would explain the benefits of the restoration project on the environment, the mining history in the area and how and where to recreational gold pan without causing excessive resource damage. A cooperative agreement with the town of Hope may be developed to create an interpretive mining program.

*Cumulative Effects*

Under Alternative 3 there would be no additional cumulative effects.

## Alternative 4

*Direct and Indirect Effects*

### Recreational Gold Panning

Under Alternative 4 approximately 0.48 miles of stream will be open to gold panning and 1.28 miles will be closed. The remaining areas open to recreational gold panning use will meet most users' expectations though some users will be displaced.

Under Alternative 4, direct and indirect effects would be the same as under Alternative 2 with the following exceptions:

A bridge will be built between the existing dispersed camping area and the private lands (approximately 100' north of the Haun Trust Lands). An indirect effect of bridge construction may result in an increased interest in gold panning due to the disturbance of mine tailings and possible exposure of gold flakes in the vicinity of the bridge.

The interpretive mining cabin would not be built on National Forest lands. Instead a cooperative agreement with the town of Hope may be developed to create an interpretive mining program. The interpretive program would provide tourists with a better understanding of historical mining in and around the town of Hope. In addition, the program would show how and where to gold pan with the least amount of impact on the riparian resource.

### Dispersed Camping

Under Alternative 4, direct and indirect effects would be the same as alternative 2 with the following exceptions;

An Indirect effect of installing a temporary bridge (approximately 100 yards north of the Haun Trust Lands), is the creation of an area devoid of riparian vegetation, making dispersed camping more desirable immediately around the bridge and in the bridge footprint once removed.

### Resurrection Pass National Recreation Trail

Under Alternative 4 the RPNRT users would experience the greatest impact from the restoration project because trail users would be in the same corridor within the easement as the moving equipment in and out of the project area. However, the trail users would be separated from the equipment access area. In addition the Resurrection Pass North Trailhead would not get upgraded under this alternative.

In addition to the short-term direct effects listed previously, trail users would be temporarily re-routed to a trail immediately adjacent to the existing trail. Due to the safety concerns of putting the trail so close to the route used for construction equipment, contractors would be required a one time initial mobility of construction equipment along the RPNRT. It is expected that there will be daily traffic from worker trucks, fuel trucks and occasional machinery maintenance along the trail but this use will be minimal.

A long-term direct effect of Alternative 4 would be the clearing (10 foot width) and grading along the existing RPNRT to accommodate use of construction equipment. It will take a couple of growing seasons for the trail to brush back in but the appearance of a “road” footprint will exist for many years. (It’s there now)

Interpretive signing that would benefit trail users would be placed at 3 areas along the RPNRT. The panels would explain the benefits of the restoration project, the mining history in the area, and how and where to recreational gold pan without causing excessive resource damage.

*Cumulative Effects*

Under Alternative 4 there would be no additional cumulative effects.

## Alternative 5

*Direct and Indirect Effects*

### Recreational Gold Panning

Under Alternative 5 approximately 0.48 miles of stream would be open to gold panning and 1.28 miles will be closed. The remaining areas open to recreational gold panning use would meet most users’ expectations though some users will be displaced.

Under Alternative 5, direct and indirect effects would be the same as under Alternative 2 with the following exception;

The interpretive mining cabin would not be built on National Forest lands. Instead a cooperative agreement with the town of Hope may be developed to create an interpretive mining program. The interpretive program would provide tourists with a better understanding of historical mining in and around the town of Hope. In addition, the program would show how and where to gold pan with the least amount of impact on the riparian resource.

**Dispersed Camping**

Under alternative 5 the direct and indirect effects would be the same as the no action alternative.

**Resurrection Pass National Recreation Trail**

Under Alternative 5 the direct and indirect effects to the RPNRT and users of the trail would be the same as Alternative 2 with the following exception;

There would be one interpretive sign instead of three signs located along the RPNRT.

*Cumulative Effects*

Under Alternative 5 there would be no additional cumulative effects.

**Alternative 6**

*Direct and Indirect Effects*

**Recreational Gold Panning**

Under Alternative 6 approximately 0.48 miles of stream will be open to gold panning and 1.28 miles will be closed. The remaining areas open to recreational gold panning use will meet most users' expectations though some users will be displaced.

Under Alternative 6, direct and indirect effects would be the same as under Alternative 4.

**Dispersed Camping**

Under Alternative 6 the direct and indirect effects would be the same as the no action Alternative 1.

**Resurrection Pass National Recreation Trail**

Under Alternative 6 the direct and indirect effects to the RPNRT and users of the trail would be the same as Alternative 4 with the following exception;

There would be 2 interpretive signs instead of 3 signs located along the RPNRT.

*Cumulative Effects*

Under Alternative 6 there would be no additional cumulative effects.

## Social and Economics

This section provides a brief overview of the effects of the proposed action on the social and economic environment within the Project Area. The 2002 Revised Forest Plan Final Environmental Impact Statement for the Chugach National Forest (pages III-507 through 570) gives a complete description of the social and economic environment within the boundaries of the Project Area. This section describes the affected social and economic environment and estimates the effects associated with the action alternatives. Emphasis is given to those social and economic components of the economy identified through the scoping process.

This section also provides the methodology and analytical basis for the comparison of alternatives. The values used in the analysis and presented in the report are approximate and discounted to 2004 dollars. When applied consistently throughout the analysis, they give a relative value to compare the alternatives. These values are not intended to be a precise measure of an alternative's economic effect. No significant social or economic issues were identified through the scoping process.

### Resource Contacts

The following individuals were contacted for information needed to complete this analysis and report.

•Su Alexander, Region 10 Economist

•Brian Bair, Project Fisheries Biologist, Wind River Administration Site

•Tom Laurent, Civil Engineer, Tongass National Forest

•Pat Reed, Region 3 Social Scientist

•Julie Schaefers, Region 3 Social Scientist

•Susan Winter, Economist, USDA Forest Service Inventory and Monitoring Institute

### Desired Future Condition

The Forest Plan does not describe a desired future condition for the local social or economic environment but it is an objective of the Region to help rural communities and private landowners increase their ability to adapt to economic, environmental, and social change related to natural resource management (USDA Forest Service 2003). The interpreted desired future condition for the local social environment is a professional and sustainable relationship between local communities, the Forest, and its resources. An interpreted desired future condition for the local economic conditions is to provide existing local community employment and income opportunities by providing access to forest resources.

### *Affected Environment*

For purposes of describing the economic impacts of the proposed Resurrection Creek Stream and Riparian Restoration Project the appropriate economic impact area must be defined. Criteria set forth in FSH 1909.17 Section 24, were used to estimate the impact area:

> *The impact area should be defined as (1) a functional economic unit of a size appropriate to the economic impact issue and (2) an area that includes most of the economic factors that are most directly affected by the proposed project.*

Public comments were reviewed in an attempt to identify what specific potential impact areas were of interest. The Hope community was selected as the most logical economic impact area to determine and disclose effects. The effects that would occur throughout the Kenai Peninsula Borough and other towns outside the Borough such as Anchorage, Palmer, and Girdwood would be too small to determine. The social and economic impacts associated with the action alternatives will have the greatest effects on the Hope community compared to the communities outside of Hope. However, due to its location seven miles east of Hope along the Hope Road, the smaller community of Sunrise may also be affected by changes in traffic associated with the proposed action.

Hope is a small, unincorporated community located along the southern shore of Turnagain Arm near the mouth of Resurrection Creek, and is accessible by highway and chartered aircraft. A gravel airstrip is available nearby. Both Anchorage and Kenai are accessible by road, and offer a variety of transportation services. The Hope community dates back to the 1890s when it was home to miners (Alaska Department of Community and Economic Development 2003b). Sunrise has a similar mining history dating to the same period.

The Kenai Peninsula Borough provides a refuse transfer site in Hope. Chugach Electric Association provides Hope's electricity through a combination of gas-fired and hydroelectric power plants. There is one school located in the community, attended by 14 students. Approximately one-fourth of homes use individual water wells and septic tank systems, and are fully plumbed. The school operates its own well water system. Most homes that lack plumbing are seasonal. The community of Hope does not have a health clinic, but there is emergency medical service available. Hope has two community associations, indicating a high level of organization from people concerned about their area.

#### Hope and Sunrise Community History

Alaska guidebooks refer to the town of Hope as the remnants of an early gold mining town. Both Hope and Sunrise were established in 1896 as mining camps and some limited mining still occurs in the area. The Hope community has invested substantially into the mining history of the area. The Hope and Sunrise Historical and Mining Museum is a prominent landmark in Hope and contains a wealth of historic mining history including several buildings, tools, photographs, and a variety of other historic artifacts. Several books, book chapters, and websites have been written and are devoted to Hope's mining history (e.g. Pedersen and Pedersen 1983; Ohr and Grundman 1986; Koman 1989; Morgan

1994; The Alaska Geographic Society 1994; Buzzell 1996; Olthuis 1999; Kenai Peninsula Historical Association 2002). For a community of its size, Hope, has an unusually large amount of resources devoted to it's historic mining character. The interpretive signs and plans in this project will serve to enhance visitors' and residents' understanding of this history.

### Demographics

The following demographic information has been complied from the 2000 Census (US Census Bureau) and the Alaska Department of Community and Economic Development. It should be noted that these data were derived from a small samples of households rather than all households. Due to the small size of the communities of Hope and, especially, Sunrise, the data may contain unreported sampling error. In the case of Sunrise, the sample size was so small that many of the demographic characteristics aside from total population may be misleading and consequently are not reported.

In 2003 Hope had an estimated population of 161 and Sunrise had a population of 18 (Alaska Department of Community and Economic Development). Between 1990 and 2000 the population of Hope declined by about 18 percent (US Census Bureau). According to the 2000 Census, most residents are between the ages of 45-54, with Alaska Natives accounting for less than 6 percent of the population. There were 175 total housing units, 98 of which were vacant although 84 of these vacant housing units are used only seasonally. The average household size was 2.2 people. Forty-six percent of Hope residents 5 years and older had lived in the same dwelling for the past 5 years.

### Employment and Income

Employment statistics help us understand overall growth in economic activity and the job opportunities this growth creates. All employment estimates used in this portion of the document refer to average annual employment. Here, one employment unit is equivalent to 12 months of full or part-time work.

Tracking employment changes in communities using census data is somewhat problematic since industrial classifications exhibit some variations from 1990 to 2000. Accordingly, in order to accurately track changes in employment it is first necessary to recombine the 1990 and 2000 data into comparable but fewer groupings. This results in greater accuracy at the expense of lower "resolution." Therefore, changes within groups are accurate but it is also more difficult to know which of the increased number of employment sectors is contributing to the change. During the period from 1990 to 2000 employment in Hope declined in all but two sectors; both transportation-information-warehousing-utilities and public administration (US Census Bureau). Hope lost the most jobs in the construction, wholesale trade, and social services sectors.

Currently, Hope has limited economic opportunities (Crone et al. 2002). The school and local retail businesses provide most of the employment in Hope (Alaska Department of Community and Economic Development 2003b). The unemployment in 2000 was near the state average, or about 6 percent of the

labor force. However, a majority of Hope residents, nearly twice the state average, are not in the labor force.

Education offers one of the few permanent job opportunities in the community. Government employment is year round and tends to pay well, moderating some of the effects of seasonal and lower wage employment within the community.

The community has a small seasonal sawmill that provides lumber mainly for local projects. Similarly, the amount of construction employment varies with projects in the area and does not usually offer year-round employment. Increases in visitors and occupancy of seasonal homes have provided some growth to the area in the retail trade, transportation, and service sectors.

**Table 8 Employment Statistics by Industry for Hope, Alaska**

| Industry | Pct Total Employment | Total Employment 1990 | Net Change Employment 1990-2000 | 1990-2000 Rate of Growth |
|---|---|---|---|---|
| Agriculture, forestry, fishing, mining, manufacturing | 15 | 9 | -3 | -33 |
| Construction | 0 | 7 | -7 | -100 |
| Wholesale trade | 0 | 7 | -7 | -100 |
| Retail trade, arts, entertainment, recreation, accommodations, food services | 15 | 21 | -15 | -71 |
| Transportation, information, warehousing, utilities | 38 | 0 | 15 | 1500 |
| Finance, insurance, real estate, rental, leasing | 0 | 0 | 0 | 0 |
| Professional, scientific, management, administrative, other professional services. | 0 | 0 | 0 | 0 |
| Educational, health, social services | 0 | 17 | -17 | -100 |
| Public administration | 31 | 0 | 12 | 1200 |
| Total | 100 | 61 | -22 | -36 |

Source: DEMOsthenes, Version 2.4, December 2003 The data on which DEMOsthenes is built was restructured between 1990 and 2000, so the changes in employment in the indicated sectors may only represent reclassification of jobs.

In 2000, the median household income for Hope was $21,786; per capita income was $9,079; and 11.7 percent of residents were living below the poverty level. In comparison to other communities in the Kenai Peninsula Borough, Hope has a relatively high percentage of individuals below poverty level as well as a high

number of people who are either unemployed or not in the labor force. However, many Hope community members appear to have subsistence preference which likely lowers the level of labor force participation and median incomes (Crone et al.. 2002).

### Forest Resource-Related Industries

Some mining activities continue today near Hope and Sunrise, and a small sawmill is used by the community of Hope. Two residents have commercial fishing permits. Crone et al. (2002) stated that "Forest management activity near Hope is likely to have greater community-level economic and social impacts—these communities had the largest percentages of people below poverty level as well as high percentages of people who were either unemployed or not in the labor force. They also had low economic diversity scores, low median incomes, and subsistence preference."

In the smaller, inland communities of Hope, Girdwood, Moose Pass, and Cooper Landing, residents also are involved in the commercial fishing industry. The percentage of total employment in the tourism industry is larger in this group of communities than it is in the Anchorage and Kenai-Soldotna areas.

## *Environmental Consequences*

### Methodology

The following analysis addresses social and economic effects. Projected effects are compared with the baseline conditions. The analysis highlights both social and economic issues and potential impacts. In some cases, quantitative measures have been used, but in most cases, the discussion is qualitative. The methods and assumptions employed to assess project effects are discussed in the following sections.

### Regulations and Policies

Executive Order 12898 on Environmental Justice requires all federal agencies to identify and consider disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority, or low-income populations. Neither Hope nor Sunrise has significant minority populations. Racially, Hope is 94 percent white. Hope is not federally recognized as a Native village. While none of the families in Hope in 2000 were below the federal poverty standards, they did have one of the area's lowest annual household income levels ($21,786).

Stream restoration treatments designed to improve riparian habitat stabilizing stream channels and reducing road- and trail-related sediment thus would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to improve the ecological health of the area. For this project, no populations or issues were identified in terms of environmental justice.

Social and economic resources have been analyzed for the Forest lands within the Project Area. The primary analysis area includes the Hope and Sunrise communities. The social and economic issues that are addressed in this analysis include costs, employment and income, noise, traffic, fishing, and recreational mining opportunities. Employment will be described in terms of a job-year. A job-year is a job that lasts the equivalent of one year. For example 10 job-years could be 10 jobs for one year or one job for 10 years or any combination thereof. Additionally, a job-year can be full-time or part-time, seasonal or permanent. It is not a "full-time equivalent. Additionally, only direct income and employment effects are estimated. The traditional economic input-output models have been determined to be poor predictors of indirect and induced income and employment effects for this region.

The following effects indicators were used to focus the social and economic analysis and disclose relevant environmental effects.

### Measurement Indicators

•Project costs

•Personal income and wages

•Traffic (number of trips)

•Noise- (Weighted decibels" or dBA)

•Local anglers and commercial fisheries opportunities

•Recreational gold panning opportunities

In most instances these indicators have not been measured quantitatively. Therefore, the relative differences among alternatives are discussed qualitatively.

### Cumulative Effects

The cumulative effects analysis area for this resource is the Project Area, including both National Forest System lands and those under other ownership. The past, present and reasonable foreseeable actions that may affect social and economic conditions in the Project Area are:

1. The Resurrection Pass National Recreation Trail is the in process of being reconstructed. The project began in 2000 and will be completed in 2005

2. Ongoing fuels reduction project along the Hope Highway.

3. Ongoing fuels reduction project along the Palmer Creek Road. This road is adjacent to the Resurrection Creek road and within the same drainage.

4. Mr. J.D. Hahn has applied for a mineral lease on the land to the east of the Haun Trust land. If the Bureau of Land Management approves the lease, and if the Forest Service concurs with that decision, Mr. Hahn will need access and has expressed interest in using the new road, if one is built. In that case, he would install a miner's gate, possibly near the north boundary of the Haun Trust land.

5. The Seward Ranger District plans on reconstructing the Devils Pass and Romig rental cabin in 2005.

## Financial Efficiency

Financial Efficiency is a comparison of costs and benefits that can be quantified in terms of funds spent or received within the Project Area. When considering quantitative issues, financial efficiency analysis offers a consistent measure for comparison of alternatives. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important – but to recognize that non-market values are difficult to represent with appropriate dollar figures. The values not included in this part of the analysis are often at the center of disagreements and the interest people have in forest resource projects. Therefore, financial efficiency should not be viewed as a complete answer but as one tool decision makers use to gain information about resources, alternatives, and trade-offs between costs and benefits.

Table 9 displays the financial efficiency analysis for quantifiable costs by alternative. There are no revenues associated with this project. Interpretation costs for each alternative include the cost of a kiosk as well as the moving and staffing the historic cabin; the remaining difference in costs is associated with varying amounts of interpretive signs. Alternative 3 is the most costly because restores the largest area of stream and has the most interpretation associated with it.

**Table 9 Costs Associated with Each Alternative***

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Road Construction | $0 | $143,000 | $213,500 | $273,054 | $69,500 | $244,192 |
| Restoration | $0 | $590,000 | $585,500 | $553,500 | $298,000 | $424,500 |
| Interpretation | $0 | $165,000 | $115,000 | $165,000 | $115,000 | $140,000 |
| Recreation Mining | $0 | $2,000 | $0 | $2,000 | $2,000 | $2,000 |
| Total | $0 | **$900,000** | **$914,000** | **$993,554** | **$484,500** | **$810,692** |

* These costs have not been adjusted for inflation

Table 10 displays the number of 10-hour job days that would be created by the proposed actions directly associated with each activity by alternative.

**Table 10 Number of 10-Hour Job Days Directly Associated with Each Activity by Alternative**

| Activity | Alternative | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Road Construction | 0 | 36 | 52 | 50 | 30 | 50 |
| Restoration | 0 | 434 | 370 | 350 | 162 | 272 |
| Interpretation | 0 | 85 | 85 | 85 | 85 | 85 |
| Recreation Mining | 0 | 2 | 2 | 2 | 2 | 2 |
| Total | 0 | 557 | 509 | 487 | 279 | 409 |

Table 11 displays the project related job income that would be generated by the proposed actions directly associated with each activity by alternative.

**Table 11 - Project related job income Directly Associated with Each Activity by Alternative**

| Activity | Alternative | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Road Construction | 0 | $4,902 | $7,080 | $6,808 | $4,085 | $6,808 |
| Restoration | 0 | $59,095 | $50,380 | $47,657 | $22,058 | $37,036 |
| Interpretation | 0 | $11,574 | $11,574 | $11,574 | $11,574 | $11,574 |
| Recreation Mining | 0 | $272 | $272 | $272 | $272 | $272 |
| Total | 0 | $75,843 | $69,307 | $66,311 | $37,989 | $55,690 |

Table 12 displays the equivalent number of one-year job years that would be generated by the proposed actions directly associated with each activity by alternative. Note that estimated job-years do not directly translate into numbers of affected workers. Most of the jobs will be temporary seasonal positions.

**Table 12 - Number of Equivalent One Year Job-Years Associated with Each Activity by Alternative**

| | Alternative | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Jobs | | 3.5 | 3.2 | 3.0 | 1.7 | 2.6 |

## Economic Efficiency

Economic efficiency measures the production of the ‘best’ or optimal combination of outputs by the means of the most efficient combination of inputs. Optimal output can be measured in various ways but in welfare economics, it is generally held to be that output combination chosen by individual consumers in perfect markets who are responding to prices that reflect the true costs of production

(Pearce 1992). Economic efficiency is a tool that can be used to compare alternatives. It is not a useful tool in evaluating a project such as this one.

The benefits of stream restoration are not valued though markets or direct exchanges of money and can be difficult or impossible to quantify or summarize. The methods available for determining non-market value can be expensive, time and resource intensive, and the results are often subject to interpretation. The following analysis is qualitative in nature, as most values have not been quantified. The issues considered within this analysis are at a local- scale. The Forest Plan addressed and balanced resource values and uses at the larger scale. This analysis is meant to highlight resource uses and concerns in the study area and display differences between alternatives; it is not a ranking of the alternatives.

### Alternative 1 – No Action Alternative

*Direct and Indirect Effects*

Alternative 1 is the baseline for this analysis. Under this alternative, no restoration activities would take place in the Project Area due to this project. There would be no change in the social and economic conditions of the Project Area. Current fish and wildlife habitat conditions within the Project Area created by historic mining activities could conceivably persist for centuries. Mine tailings generated 60 to 100 years ago, are essentially functioning as dikes, and confine all flood flows to a single channel. Although mining disturbances occurred up to a century ago, riparian vegetation and wildlife habitat have not recovered to pre-mining conditions.

### Alternative 2

*Direct and Indirect Effects*

### Financial Efficiency- Project Costs

The cost of carrying out Alternative 2 is estimated to be approximately $900,000 over the two-year life of the project (see Table 13). The majority of the project expenditures would be on labor, rather than goods and supplies and is expected to have minimal effects on local business sales.

### Financial Efficiency

*Employment and Income*

The actions proposed under Alternative 2 would likely generate approximately the equivalent of 4 one-year jobs during the life of the project using the median income of $21,786. The actual number of specific jobs will not be known until the project is locally or regionally contracted. Most of these anticipated jobs would be associated with stream restoration activities and would occur during 2005 to 2006. The other anticipated jobs would be associated with road and trail

construction and environmental interpretation. The limited heavy machinery available in Hope and Sunrise suggests that the machinery would have to come from towns such as Anchorage, Palmer, or Kenai. The project would generate about $75,843 in total job related income for the duration of the project. Spending associated with the projected project job related income would have a minimal effect on the Hope community because of the limited opportunities to spend money in Hope. Indirect income effects will be minimal in Hope and virtually nonexistent regionally because of the relatively small amount of income created by this project (Table 13).

## Economic Efficiency

*Noise*

Project-related activities would generate noise. Traffic is the primary source of human noise presently generated in the Project Area. Light automobile traffic at 100 feet has a typical sound level of 50 dBA. A heavy truck at 50 feet has a typical sound level of 90 dBA. Because the dB scale used to describe noise is logarithmic, a doubling of traffic noise source (i.e., twice as much traffic on a road) produces a 3-dBA-increase average roadway noise. Average sound levels decrease with distance and intervening vegetation. The majority of the project-related truck trips would likely be spread throughout the day. Each truck would likely represent a discrete rather than a cumulative addition from a noise perspective.

Stream restoration activities would also generate noise from sources such as dozers, track hoe, dump truck, front-end loader, and chainsaws. Intervening vegetation would be expected to absorb sound energy associated with stream restoration activities.

The majority of the Project Area is located away from occupied residences, with the exception of the Haun Trust Lands. Treatment in these areas would be noticeable to people in the vicinity. Some visitors would likely avoid work areas in the short-term. Most construction and stream restoration activities would take place during the daylight hours.

*Passenger Vehicle Traffic*

Passenger vehicle traffic would be generated by work crews traveling to and from the work sites under the proposed action alternatives. At this time, it is unknown how many workers will be local residents. Most workers would likely camp or stay at local accommodations, minimizing the number of daily round trips. Additional vehicles are unlikely to affect existing local travel flows.

*Fishing*

The goal of this project is to increase local fish abundance, benefiting local recreation anglers. Because the magnitude of the fish population increase is unknown, the benefits to the local recreation anglers and businesses and regional commercial fisheries cannot be quantified.

*Recreational Gold Panning*

The recreational mining closure south of the project will impact individuals who have enjoyed this activity. They will move to other suitable locations for recreational mining in the area. There will be a new parking area and interpretation programs.

*Cumulative Effects*

The scope of the ongoing or foreseeable future actions within or near the Project Area that could add to the effects of the proposed actions include the Borough and State Highway road construction projects and proposed Forest Service projects. The cumulative effects of these several projects are likely to have noticeable social and economic effects on the communities of Hope and Sunrise and minimal effects on the regional economy. In contrast to the minimal level of activity occurring in or near the Hope community in recent years, these combined projects would likely lead to sustained activity over a 5-year period of time resulting in increased employment opportunities, traffic, and noise. This increased activity would put a greater demand on local services and local housing availability. It is expected that this type of activity would likely be seen as unfavorable by some Hope residents and favorable by others.

## Alternative 3

*Direct and Indirect Effects*

### Financial Efficiency

*Project Costs*

The cost of carrying out Alternative 3 is estimated to be approximately $914,000 over the two-year life of the project (Table 13), which is quite similar to Alternative 2. Alternative 3 restores a slightly less amount of stream, includes less interpretation, and no changes to the Resurrection Pass National Recreation Trail except for a reconstructed trailhead.

### Economic Efficiency

*Employment and Income*

The employment and income effects for Alternative 3 are effectively the same as Alternative 2.

*Noise*

The total noise effects for Alternative 3 are similar to Alternative 2. Although individuals on Haun Trust Lands would not experience noise associated with the Resurrection Pass National Recreation Trail reroute and stream restoration, they would experience noise associated with road construction that would occur on adjacent National Forest land.

*Passenger Vehicle Traffic*

Passenger vehicle traffic would be similar to Alternative 2.

*Fishing*

The effects of increased fish abundances on local recreation anglers and regional commercial fisheries would be similar to Alternative 2.

*Recreational Gold Panning*

Unlike Alternative 2, Alternative 3 has no proposed closure for recreational mining. However, Alternative 3 has interpretation and a parking area associated with this Alternative, which could result in increased opportunities for recreational mining.

*Cumulative Effects*

The cumulative effects for Alternative 3 are the same as for Alternative 2 and all other action alternatives.

### Alternative 4

### Financial Efficiency

*Project Costs*

The cost of Alternative 4 is estimated to be approximately $993,500 over the two-year life of the project, which is the most costly alternative, but still similar to the costs of Alternatives 2 and 3 (Table 13). Alternative 4 has similar stream restoration costs, but higher road construction costs when compared to Alternatives 2 and 3.

### Economic Efficiency

*Employment and Income*

Alternative 4 generates approximately 3.0 job years and $66,311 in project related job income, which are effectively the same as in Alternatives 2 and 3.

*Noise*

The total noise effects for Alternative 4 are similar to Alternative 2. However, Haun Trust Lands would be subject to less noise because the Trust land would not be accessed for the purposes of the project. Additionally there would be no stream restoration activities on the Haun Trust Lands.

*Passenger Vehicle Traffic*

Passenger vehicle traffic would be similar to Alternative 2.

*Fishing*

The effects of increased fish abundances on local recreation anglers and regional commercial fisheries would be similar to Alternative 2.

*Recreational Gold Panning*

The social and economic effects on recreation mining are the same as Alternative 2.

*Cumulative Effects*

The cumulative effects for Alternative 4 are the same as for all other action alternatives.

## Alternative 5

*Direct and Indirect Effects*

### Financial Efficiency

*Project Costs*

Alternative 5 has an estimated cost of approximately $485,500 over the one-year life of the project (Table 13). Alternative 5 is the least costly of all action alternatives. While it restores slightly more stream than Alternative 6, it does not include a lower bridge or bridge over Resurrection Creek. This is the only alternative that is estimates the to completion of both road and trail construction and stream restoration activities in the first year of the project.

### Economic Efficiency

*Employment and Income*

Alternative 5 generates approximately 1.7 job-years and $37,989 in project related job income, which is the least number of job-hours and project-related income for all of the proposed actions (Table 13).

*Noise*

The total noise effects for Alternative 5 are less than Alternatives 2, 3, and 4 because a smaller area of stream would be restored and there is no modification of the dispersed camping area. However, the noise effects that would specifically impact the Haun Trust Lands would be the same as Alternative 2.

*Passenger Vehicle Traffic*

Passenger vehicle traffic would slightly less than Alternatives 2, 3, and 4 because a smaller area of stream would be restored.

*Fishing*

The effects of increased fish abundances on local recreation anglers and regional commercial fisheries would be slightly less than Alternatives 2, 3, 4.

*Recreational Gold Panning*

The economic effects of recreational gold panning are the same as Alternative 2.

*Cumulative Effects*

The cumulative effects for Alternative 5 are the same as for all other action alternatives.

### Alternative 6

*Direct and Indirect Effects*

### Financial Efficiency

*Project Costs*

The cost of carrying out Alternative 6 is estimated to be approximately $811,000 over the two-year life of the project, restoring 0.5 miles of stream (Table 13).

### Economic Efficiency

*Employment and Income*

Alternative 6 would generate approximately 2.6 job-years and $55,690 in project related job income (Table 13). The employment and income effects for Alternative 6 are effectively the same as Alternative 5, and less than the rest of the alternatives.

*Noise*

The total noise effects for Alternative 6 are similar to Alternative 5. Although the Haun's Trust Land would experience a similar level of noise associated with Alternative 4.

*Passenger Vehicles*

Passenger vehicle traffic would be most similar to Alternative 5

*Fishing*

The effects of increased fish abundances on local recreation anglers and regional commercial fisheries would be similar to Alternative 5.

*Recreational Gold Panning*

The social and economic effects on recreational gold panning are the same as Alternatives 2, 4, and 5. Alternative 6 has less interpretation than Alternatives 2 and 4 and slightly more than Alternatives 3 and 5.

*Cumulative Effects*

The cumulative effects for Alternative 6 are the same as for all other action alternatives.

### Tribal Consultation

The Kenaitze Indian Tribe was contacted during the scoping process, along with the Native American Fish and Wildlife Society.

### Forest Plan Consistency

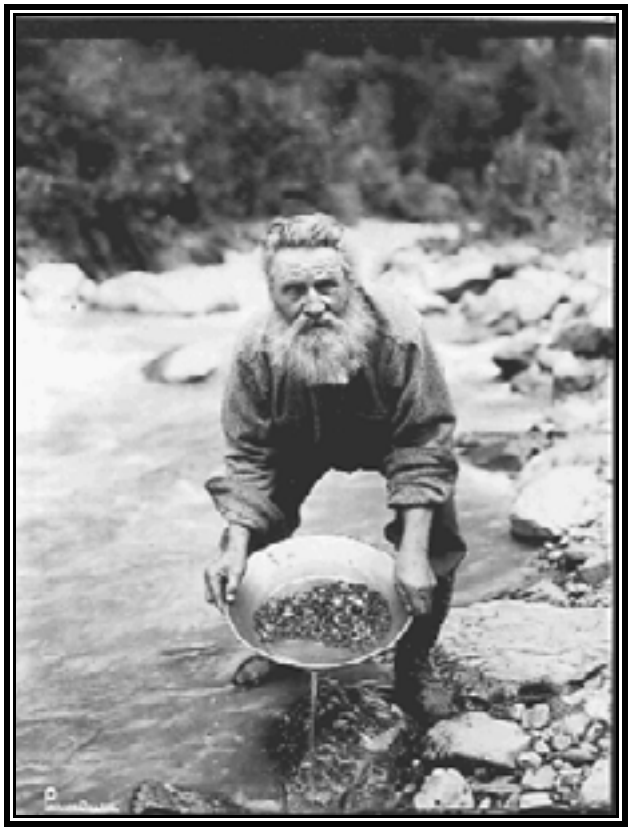
- This project will meet the Chugach Forest Plan direction to
- Work with local communities and interest groups to identify, record, restore, or preserve heritage resources on National Forest System lands (p III-12).

- Support heritage-based tourism activities (p III-12).
- Cooperate and support local communities and interest groups to further their interests in interpreting, identifying, recording, restoring, or preserving heritage resources on non-National Forest System lands (p III-12).
- There are no general social or economic forest plan directions.

**Table 13 Social and Economic Effects Summary by Alternative**

| | Alternatives | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Project Costs | - | $900,000 | $914,000 | $993,500 | $484,500 | $811,000 |
| Employment - Job Years | - | 3.1 | 3.2 | 3.0 | 1.7 | 2.6 |
| Job Related Income | - | $66,992 | $69,307 | $66,311 | $37,989 | $55,690 |

Figure 11 Gold Panner



Source: http://www.library.state.ak.us/hist/goldrush/table.html

## Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses are those expected to occur on the Forest over the next ten years. These uses include recreation opportunities including outfitter guides, timber salvage, and potential mining activities. Long-term productivity refers to the capability of the land to provide resource outputs for a period of time beyond the next ten years.

The minimum management requirement established by regulation (36 CFR 219.27) provides for the maintenance of long-term productivity of the land. Minimum management requirements prescribed by the forest-wide standards and guidelines assure that long-term productivity of the land will not be impaired by short-term uses.

A short-term use includes construction of temporary roads and trails which would disturb the land surface. These areas would be returned to vegetation cover and would not reduce long-term productivity.

As provided for by the Forest Plan, minimum management requirements guide implementation of the action alternatives. Adherence to these requirements ensures that long-term productivity of the land is not impaired by short-term uses.

Monitoring specified in this EIS and the Forest Plan validates that the management requirements and mitigation are effective in protecting long-term productivity.

## Unavoidable Adverse Effects

Adverse effects to fish would be short-term and would occur during construction. The impact to the overall populations is expected to be very small and limited to resident fish and two cohorts of anadromous fish within and potentially one mile downstream of the project reach. The in-stream implementation phases of this project occur post-fry and smolt emigration. The diversion would allow adult pink, chinook and coho salmon to immigrate through the project area unimpeded and spawn up-stream. During implementation (4-5 weeks), de-watered sites would be electro-shocked after push up dam construction to remove any fish stranded behind the impoundment. The majority of fish would be removed from the dewatered area and moved up river before fill and grade. Direct impacts within the project reach would be limited to age 0 and 1 for chinook salmon and coho salmon, resident Dolly Varden and sculpin.

## Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

All soil that is removed or covered as a result of road construction and parking area development will result in irreversible and irretrievable loss in the productive capacity of the soil.

All action alternatives have irreversible and irretrievable commitments of heritage resources. Tailings and associated mining artifacts are not only physical representations of history, they, even when newly created; give a visual sense of history. Even newly created tailings look nearly identical to historic ones. Section 106 of the National Historic Preservation Act makes reference to this visual sense of history when allowing that historic properties may still be eligible for listing even when they have been newly modified, as long as they maintain their visual sense of place. Nowhere is this more applicable than to historic mining areas, known as historic vernacular landscapes. In Alternatives 2 through 6 there will be destruction of the tailings present in the project area. These tailings, and associated mining artifacts are irretrievable. Once removed from there contextual resting places artifacts lose their archaeological value as information resources, and once the restoration takes place, the inability to recreate the tailings exactly as they were will be irreversible.

Harvesting of live and dead trees from the project area for channel construction and floodplain development would be an irreversible commitment of that resource. The same would apply for trees harvested for log stringer bridges or cribbed bridge abutments. Areas stripped of trees would be replanted or allowed to regenerate.

## Cumulative Effects

Cumulative effects are addressed by resource area in the environmental consequences discussion of this chapter.

## Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The Biological Evaluation for wildlife indicates that no additional informal consultation with Fish and Wildlife is necessary for wildlife species. However, consultation with Fish and Wildlife Service will continue for fisheries.

Consultation with Alaska State Historic Preservation Office is ongoing for heritage resources.

Coordination with ADNR-Office of Habitat Management and Permitting is ongoing.

**Figure 12 Sluice Box**

Source: http://www.library.state.ak.us/hist/goldrush/mining.html

# CHAPTER 4. CONSULTATION AND COORDINATION

## Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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| **Stephanie Gripne** | **T.E.A.M.S. Economist** |
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| ***Project Role & Responsibility*** | Social and Economic Analyst |
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| **Robert Gubernick** | **Engineering Geologist** |
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| ***Project Role & Responsibility*** | Hydraulic engineer and engineering geologist. Design and review responsibilities for bridge, trail and stream designs. Civil design and cost analysis for trails and bridges. |
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| **Tony Largaespada** | **Seward District Archaeologist** |
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| **Tom Laurent** | **Structural Engineer** |
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| ***Project Role & Responsibility*** | Evaluation of crossings and preliminary cost estimates and quantities for structures, access, and trail relocations |
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| ***Experience*** | Thirteen years of experience regarding structural design and construction of recreation cabins, road bridges, trail bridges, roads, and stream crossing evaluations in Forest Service Region 10. |

| **Sherry Nelson** | **Minerals Specialist** |
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# Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies of the Draft Environmental Impact Statement and/or a Summary of the FEIS, or official FEIS website link were made available to the following Federal agencies, federally recognized tribes, State and local governments, and organizations.

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**Federal**

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Honorable Lisa Murkowski, U.S. Senate

Honorable Ted Stevens, U.S. Senate

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Advisory Council on Historic Preservation, Director of Planning and Review

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USDA APHIS PPD/EAD

Natural Resources Conservation Center

National Agricultural Library

Soil Conservation Service

Department of Interior

Bureau of Land Management, Alaska Office

Office of Environmental Policy and Compliance

Department of Commerce

NOAA Office of Policy and Strategic Planning

National Marine Fisheries Service

Department of Defense

Army Corp of Engineers, Pacific Ocean Division

U. S. Navy Office of Chief of Navy Operations, Environmental Protection Division

Department of Energy

Director, Office of NEPA Policy and Compliance

Environmental Protection Agency

Environmental Protection Agency, Region 10

Department of Housing and Urban Development

National Park Service

National Park Service, Alaska Area Region

Department of Transportation

U.S. Coast Guard, Environmental Impact Branch

Federal Aviation Administration

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Federal Highway Administration

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# GLOSSARY

**Bankfull Channel —** The stream channel that is formed by the dominant discharge, also referred to as the active channel, which meanders across the floodplain as it forms pools, riffles, and point bars.

**Bankfull Width / Depth Ratio** — The ratio of bankfull width divided by average bankfull depth.

**Bar or Gravel Bar** — (1) A sand or gravel deposit found on the bed of a stream that is often exposed during low-water periods. (2) An elongated landform generated by waves and currents, usually running parallel to the shore, composed predominantly of unconsolidated sand, gravel, stones, cobbles, or rubble and with water on two sides.

**Bed Load** — (1) Sediment particles up to rock, which slide and roll along the bottom of the streambed. (2) Material in movement along a stream bottom, or, if wind is the moving agent, along the surface. (3) The sediment that is transported in a stream by rolling, sliding, or skipping along or very close to the bed. In USGS reports, bed load is considered to consist of particles in transit from the bed to an elevation equal to the top of the bed-load sample nozzle (usually within 0.25 feet of the streambed). Contrast with material carried in Suspension or Solution.

**Bed Shear Stress** — The force per unit area exerted by water as it shears over a surface.

**Channel Stabilization** — Erosion prevention and stabilization of velocity distribution in a channel using jetties, drops, revetments, vegetation, and other measures.

**Cross Section** — A graph or plot of ground elevation across a stream valley or a portion of it, usually along a line perpendicular to the stream or direction of flow.

**D50** — Median particle/grain size of sediment.

**Disturbed Reference** — A disturbed reach of stream that possesses similar channel morphology, hydrology, sediment regime and biota relative to the reach of stream to be analyzed, rehabilitated or restored.

**Entrenchment Ratio** — Flood-prone width divided by bankfull width; a measure of floodplain accessibility and inundation.

**Floodplain** — (1) (FEMA) Any normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually low land adjacent to a river, stream, watercourse, ocean or lake. (2) A strip of relatively smooth land bordering a stream, built of sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current. It is called a Living Flood Plain if it is overflowed in times of high water but a Fossil Flood Plain if it is beyond the reach of the highest flood. (3) The lowland that borders a stream or river, usually dry but subject to flooding. (4) The transversely level floor of the axial-stream drainage way of a semi-bolson or of a major desert stream valley that is occasionally or regularly alluviated by the stream overflowing its channel during flood. (5) The land adjacent to a channel at the elevation of the bankfull discharge, which is inundated on the average of about 2 out of 3 years. The floor of stream valleys, which can be inundated by small to very large floods. The one-in-100-year floodplain has a 0.01 chance per year of being covered with water. (6) That land outside of a stream channel described by the perimeter of the Maximum Probable Flood. Also referred to as a Flood-Prone Area.

**Flood-prone Width** — Width or extent of floodwaters within a valley.

**Graminoid** — A grass or grass-like plant.

**In-stream Large Woody Material** — Coarse wood material such as twigs, branches, logs, trees, and roots that fall into streams.

**Length of Meander** — One full sine wave of a stream meander.

**Mainstem** — (1) The major reach of a river or stream formed by the smaller tributaries which flow into it. (2) The principal watercourse of a river, excluding any tributaries

**Meander** — (1) The turn of a stream, either live or cut off. The winding of a stream channel in the shape of a series of loop-like bends. (2) A sinuous channel form in flatter river grades formed by the erosion on one side of the channel (pools) and deposition on the other side (point bars).

**Meander Belt Width** — Amplitude or width containing the meander.

**Mine tailings** — Rock spoils from mining activity.

**Morphology** — (1) The science of the structure of organisms. (2) The external structure form and arrangement of rocks in relation to the development of landforms. River morphology deals with the science of analyzing the structural make-up of rivers and streams. Geomorphology deals with the shape of the Earth's surface.

**Organic** — Matter derived from living organisms.

**Plots** — A map or plan; a measured piece of land. To mark or note on or as if on a map or chart.

**Pool** — (1) A location in an active stream channel, usually located on the outside bends of meanders, where the water is deepest and has reduced current velocities. (2) A deep reach of a stream; a part of the stream with depth greater than the surrounding areas frequented by fish. The reach of a stream between two riffles; a small and relatively deep body of quiet water in a stream or river. Natural streams often consist of a succession of pools and riffles.

**Recreation Opportunity Spectrum (ROS**) — A system developed by the Forest Service that classifies recreation settings on National Forest lands according to their physical, social, and managerial characteristics. These ROS settings are formally applied to National Forest lands and not adjacent private lands. However, the presence and condition of private lands influence the ROS settings assigned to National Forest lands (ROS Users Guide, 1982).

**Reference Reach** — Undisturbed reach of stream that possesses similar channel morphology, hydrology, sediment regime and biota relative to the disturbed site to be analyzed, rehabilitated or restored.

**Return Period (or Recurrence Interval**) — In statistical analysis of hydrologic data, based on the assumption that observations are equally spaced in time with the interval between two successive observations as a unit of time, the return period is the reciprocal of 1 minus the probability of a value equal to or less than a certain value; it is the mean number of such time units necessary to obtain a value equal to or greater than a certain value one time. For example, with a one-year interval between observations, a return period of 100 years means that, on the average, an event of this magnitude, or greater, is not expected to occur more often than once in 100 years. Also see Exceedence Interval, Recurrence Interval, Flood Frequency, and Frequency Curve.

**Redd** — A depression in gravel created by salmon and trout to deposit and incubate their eggs.

**Riffle** — (1) A shallow rapids, usually located at the crossover in a meander of the active channel. (2) Shallow rapids in an open stream, where the water surface is broken into waves by obstructions such as shoals or sandbars wholly or partly submerged beneath the water surface. (3) Also, a stretch of choppy water caused by such a shoal or sandbar; a rapid; a shallow part of the stream.

**Riparian Areas (Habitat)** — (1) Land areas directly influenced by a body of water. Usually such areas have visible vegetation or physical characteristics showing this water influence. Streamsides, lake borders, and marshes are typical riparian areas. Generally refers to such areas along flowing bodies of water. The term “littoral” is generally used to denote such areas along non-flowing bodies of water. (2) (USFWS) Plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent Lotic and Lentic water bodies (rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: (a) distinctively different vegetative species than adjacent areas, and (b) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between Wetlands and Uplands.

**Roaded Modified** — An area characterized by a modified landscape, easy access, moderate evidence of other users, and timber management activities are likely (USDA Forest Service, 2002).

**Sediment** — (1) Soil particles that have been transported from their natural location by wind or water action; particles of sand, soil, and minerals that are washed from the land and settle on the bottoms of wetlands and other aquatic habitats. (2) The soil material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by erosion (by air, water, gravity, or ice) and has come to rest on the earth’s surface. (3) Solid material that is transported by, suspended in, or deposited from water. It originates mostly from disintegrated rocks; it also includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation. (4) In the singular, the word is usually applied to material in suspension in water or recently deposited from suspension. In the plural the word is applied to all kinds of deposits from the waters of streams, lakes, or seas, and in a more general sense to deposits of wind and ice. Such deposits that have been consolidated are generally called sedimentary rocks. (5) Fragmental or clastic mineral particles derived from soil, alluvial, and rock materials by

processes of erosion, and transported by water, wind, ice, and gravity. A special kind of sediment is generated by precipitation of solids from solution (i.e., calcium carbonate, iron oxides). Excluded from the definition are vegetation, wood, bacterial and algal slimes, extraneous lightweight artificially made substances such as trash, plastics, flue ash, dyes, and semisolids.

**Semi-Primitive Non-Motorized** — An area characterized by a predominantly natural or natural-appearing environment. Interaction with between other users is low, but there is often evidence of users.

**Side Channels** — Typically small stream channels which branch off of the mainstream channel.

**Snag** — A tree or branch embedded in a lake or streambed. A stub or stump remaining after a branch has been lopped or torn off.

**Smolt** — A juvenile, silvery salmon up to 15 cm long, which has lost its parr marks and has attained the silvery coloration of the adult. This coloration signifies the readiness of the young fish to migrate to the seas and its ability to adapt to the water environment.

**Spawning Gravel** — Streambed substrate suitable for salmonid spawning.

**Succession** — (Biology) (1) The ecological process of sequential replacement by plant communities on a given site as a result of differential reproduction and competition. (2) Directional, orderly process of change in a living community in which the community modifies the physical environment to eventually establish an ecosystem which is as stable as possible at the site in question.

**Thalweg** — (1) The line connecting the deepest points along a stream. (2) The lowest thread along the axial part of a valley or stream channel. (3) A subsurface, ground-water stream percolating beneath and in the general direction of a surface stream course or valley. (4) The middle, chief, or deepest part of a navigable channel or waterway.

**Turbidity** — A measure of light obscuration by water. Turbidity increases as the amount of suspended sediments in the water column increase.

**Woody Debris** — Coarse wood material such as twigs, branches, logs, trees, and roots that fall into streams.

# APPENDIX A RESPONSE TO COMMENTS

## Response to Comments on Draft Environmental Impact Statement

The Elk Bugs and Fuels Draft Environmental Impact Statement was issued for public comment in June of 2003. The Forest Service received comments from eight individuals and organizations.

| Individual or Organization | Letter # |
|---|---|
| Stephen Hmurciak | 1 |
| U.S. Environmental Protection Agency | 2 |
| Department of Natural Resources<br>Office of Habitat Management and Permitting | 3 |
| Wayne Moliter | 4 |
| Kenai Peninsula Borough | 5 |
| State of Alaska Department of Natural Resources<br>Office of Project Management and Permitting, Alaska Coastal Management Plan (This letter does not have specific comments) | 6 |
| Department of Resources, Southeastern Region Land Office<br>Division of Mining , Land and Water | 7 |
| State of Alaska Department of Environmental Conservation | 8 |

The following comments outlined in the letters numbered above have been coded as follows:

Letter #- comment #: e.g. 3-1 (letter 3, comment 1)

April 1, 2004

The following are my comments pertaining to the Resurrection Creek stream restoration project.

I support Alternative 3 because it is the only alternative that does not impact the Resurrection Pass Trail. Overall it is also the most recreationally-focused alternative. 1-1

This area is primarily used for recreation and any project planned here should at least be concerned with impacts to these majority users. The preferred alternative totally disregards this by turning part of the Resurrection Pass Trail into a road. Even though this part of the trail was formerly a road, it is now a trail. The USFS should recognize the importance of keeping this trail as it is. It is nationally recognized and the most well-known trail on the Forest. Every effort should be made to avoid impacting the trail and its users during the span of this project. 1-2

Stephen Hmurciak
P.O. Box 245
Moose Pass, AK 99631
907-288-5054
stephen1@ptialaska.net

Note: Latter dated 4/1/2004, mailed 4/30/04, received 5/3/04

| Comment | Response |
|---|---|
| 1-1 | Your support of Alternative 3 is noted. |
| 1-2 | Recreational resources are analyzed in the Social Environment of Chapter 3 pages 123-138. We recognize the importance of this Nationally designated trail, and have developed alternatives that do not use the trail to access the project area. Effects to recreationist have been displayed for all alternatives. An additional mitigation measure has been added for trail users as follows: On Saturdays and Sundays, no heavy equipment operations would occur within ¼ mile of the Resurrection Pass National Recreation Trail. |

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 10**
1200 Sixth Avenue
Seattle, Washington 98101

May 24, 2004

OPTIONAL FORM 99 (7-90)

**FAX TRANSMITTAL** # of pages ▶ 3

| | |
|---|---|
| To DAVE BLANCHET | From BILL RYAN |
| Dept./Agency | Phone # 206-553-8561 |
| Fax (907) 743-9480 | Fax # |

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Reply To
Attn Of: ECO-088

Dave Blanchet
Chugach National Forest
3301 C Street, Suite 300
Anchorage, Alaska 99503-3998

Dear Mr. Blanchet:

The U.S. Environmental Protection Agency (EPA) has reviewed the draft Environmental Impact Statement (EIS) for the proposed **Resurrection Creek Stream and Riparian Restoration Project** (CEQ No. 040149) in accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act. The draft EIS evaluates a No Action alternative and five (5) action alternatives to accelerate the recovery of riparian areas and fish and wildlife habitat along Resurrection Creek on the Kenai Peninsula in Alaska. The draft EIS identifies Alternative 4 as the agency-preferred alternative.

EPA supports the Forest Service's efforts to restore riparian areas and habitat that have been degraded by the placement of mine tailings in the alluvial valley bottom of Resurrection Creek. In recreating a complex of stream channels and wetlands, the project holds great promise of restoring high quality habitat for salmon, bears, bald eagles, moose and other fish and wildlife species. As a consequence, we support the selection of Alternative 4 as it would maximize the restoration efforts on Forest Service lands. Because Alternative 2 would provide additional environmental benefits (compared to Alternative 4) by extending the restoration activities onto private lands (the Haun Trust Lands), we encourage the Forest Service to pursue this option in your discussions with the landowners.

While we are generally supportive of the project and its overall objectives, we have some concerns with the lack of detail in the EIS related the ultimate disposition of the tailings that currently occupy the valley bottom. While the EIS indicates that Alternative 4 would involve "mechanical manipulation and grading of up to 139,380 cubic yards of mine tailings to recover floodplain width and elevations," it is not clear whether some, or all, of the tailings would ultimately remain in the valley bottom or whether some, or all, of it would be removed and disposed of at another location. The draft EIS indicates that the preferred alternative would include the creation of a parking lot in the vicinity of the dispersed camping area that would utilize materials from the tailings piles. The EIS does not, however, indicate how much material would be used for this purpose. The EIS should be revised to clearly indicate whether the majority of the tailings are expected to remain within the valley bottom or whether they would be

2-1

2-2

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2

removed and disposed of outside the valley bottom. If the latter is the case, disposal sites, disposal volumes, and associated environmental effects should be identified in the EIS. 2-2

We are also concerned with the potential for the project to release mercury contained within or below the tailings into Resurrection Creek. The EIS suggests that mercury was likely used as part of historic placer mining activities, but the amount or location of any mercury within the project area is presently unknown. The draft EIS states that mercury compounds pose a potential threat to fish and other aquatic species. Because of this risk and the fact that the release of mercury into Resurrection Creek associated with project activities is highly uncertain, we recommend that the EIS provide additional information related to actions that would be taken to identify the presence of mercury during project-related activities and the mitigation measures that would be employed in the event that mercury is encountered. The EIS should also discuss field procedures that would be employed to ensure that any mercury encountered is quickly identified and removed. While Chapter 2 of the draft EIS includes a very brief description of the mitigation measures that would be employed related to reducing the potential for releasing mercury, we believe that the EIS should discuss these measures in greater detail to provide the public and decision maker with a more complete understanding of how those measures would be implemented in the field. 2-3

Based on our review and evaluation, we have assigned a rating of EC-2 (Environmental Concerns - Insufficient Information) to the draft EIS. This rating, and a summary of our comments, will be published in the *Federal Register*. A copy of the rating system used in conducting our review is enclosed for your reference.

Thank you for the opportunity to provide comments on the draft EIS. I urge you to contact Bill Ryan (206-553-8561) of my staff at your earliest opportunity to discuss our comments and how they might best be addressed in the EIS.

Sincerely,

Jonathan R Freedman

for Judith Leckrone Lee, Manager
Geographic Implementation Unit

Enclosure

| Comment | Response |
|---|---|
| 2-1 & 2-2 | Up to approximately 20,000 cubic yards of tailings could be used for parking area construction, and an additional 20,000 cubic yards of tailings could be wasted onto private lands within the project area. Refer to the mitigations section of Chapter 2 in the FEIS. |
| 2-3 | Additional information regarding mercury has been added to the Aquatic Resources and Hydrology sections of Chapter 3, as well as additional mitigation measures for mercury in Chapter 2 of the FEIS. |

**U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action***

**Environmental Impact of the Action**

**LO – Lack of Objections**
The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

**EC – Environmental Concerns**
EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

**EO – Environmental Objections**
EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

**EU – Environmentally Unsatisfactory**
EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

**Adequacy of the Impact Statement**

**Category 1 – Adequate**
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

**Category 2 – Insufficient Information**
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

**Category 3 – Inadequate**
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

# MEMORANDUM

# State of Alaska

Department of Natural Resources
Office of Habitat Management & Permitting

**TO:** Susan Magee
Project Review Supervisor, OPMP

**DATE:** May 12, 2004

**FROM:** Stewart Seaberg SRS
Habitat Biologist, OHMP

**TELEPHONE NO:** 269-6980
**FAX NO:** 269-5673

**SUBJECT:** Resurrection Creek Stream and Riparian Restoration Project
SID No. AK 0404-06AA, NEPA Review

The Alaska Department of Natural Resources, Office of Habitat Management and Permitting (OHMP) has reviewed the USDA Forest Service (Forest Service) Draft Environmental Impact Statement (DEIS) of the Resurrection Creek Stream and Riparian Restoration Project. The purpose of this project is to restore segments of Resurrection Creek south of Hope, AK in the Chugach National Forest. The streambed and riparian areas were disturbed by gold mining activities a century ago, and natural reclamation has not restored the site.

**Draft Environmental Impact Statement Comments**

The document described six alternative courses of action for restoring the stretch of Resurrection Creek near the confluence with Palmer Creek, approximately 5 miles south of Hope. The project will alter fish and riparian habitat, stream hydrology, recreational mining, use of nearby recreational areas, private mining operations, and the historical significance of the area. OHMP supports this fish habitat restoration project and the rehabilitation of spawning and rearing habitat for anadromous fish in Resurrection Creek.

With the exception of Alternative 1 (No action), all of the alternatives will restore Resurrection Creek by removing and regrading tailings piles, increasing the amount of large woody debris in the stream, restoring stream meanders and complexity, and increasing the diversity of the riparian vegetation. Differences between the alternatives consist of length of the restored segments, the amount of interpretive work done, road, trail, and equipment access to the restoration area, and areas of the stream closed to recreational mining.

The preferred alternative (Alternative 4) would include restoring 0.9 miles of Resurrection Creek on Forest Service lands; accessing these lands through the Resurrection Pass Trail easement on the Haun Trust lands; construction of 3 bridges; construction of 0.35 miles of new road to shift Palmer Creek Road out of the floodplain; construction/improvement to approximately 0.4 miles of road to facilitate trail use; a closure order restricting mining activities in the restoration area; installation of three interpretative panels construction of a new parking area; and rerouting and subsequent restoration of Resurrection Pass Trail.

OHMP understands the difficulty of securing access to private land, which may necessitate the use of Alternative 4. However, should access become available; we would encourage use of one of the alternatives (e.g. Alternative 2 or a combination of Alternatives 2&3) that allows the maximum amount of restoration with a reduced amount of road and bridge construction. 3-1

Invasive and prolonged nature of heavy equipment use on this project increases the importance of using best management practices (BMP) and good planning to prevent damage by equipment. The BMPs described in Chapter 2 "Mitigation Common to All Alternatives" should be implemented to prevent fuel contamination from use, maintenance, and presence of vehicles in the floodplain and streambed areas. These BMPs will also limit sedimentation and erosion from construction activities. In addition, OHMP would suggest the following mitigation measures:

1. The number of stream crossings should be minimized and be done during the winter or at locations that will be restored as part of the larger project. Stream crossings should be made from bank to bank in a direction substantially perpendicular to the direction of stream flow.

2. Bridges should be clear span structures with abutments sufficiently offset from the ordinary highwater line to preclude armoring of the bank to protect the structure.

3. Effectiveness of mitigation techniques should be reviewed at the end of each construction seasons and improvements, if applicable, incorporated into plans for next season.

4. In-water work areas for bridge construction and removal should be isolated from the flowing waters of Resurrection and Palmer Creeks with silt curtains or similar techniques to control sedimentation.

5. Work areas for road/parking construction, tailings sorting, timber harvesting, and soil and tailings removal and placement should be isolated from Resurrection and Palmer Creeks with silt fences or similar devices to prevent sedimentation of the surface waters.

3-2

OHMP is willing to coordinate with the Forest Service and potentially close segments of Resurrection Creek to recreational gold mining/suction dredging in order to protect restoration efforts.

*Page specific comments for DEIS*
Chapter 1, 2nd paragraph under "Permits, Licenses and other Entitlements" Pg 10-
Sections 840 and 870 are reversed. Section 870 is for the protection of anadromous fish and Section 840 is for the protection of resident fish passage.

Chapter 3, 3rd paragraph under "Brown Bear" Pg 102-
The ADF&G contact for brown bear information in Game Management Unit 7 is Wildlife Biologist Jeff Selinger (907-262-9368). 3-3

**Alaska Coastal Management Program Comments**
Restoration of fish habitat, and the improvement of riparian habitat for other species are certainly consistent with the intent of the Alaska Coastal Management Program's Habitats Standard

6 AAC 80.130 and with Administrative Policy A8 "Fish Habitat Improvement" of the Kenai Peninsula Borough Coastal District. Construction practices should be specifically reviewed for consistency with the Kenai Peninsula Borough Coastal District Plan policies on equipment use in the floodplain and harvest of riparian vegetation. District Enforceable policies that may be relevant and have not already been addressed by the DEIS are:

- 2.4 Dredging and Filling- for the minimization of waterborne sediment.
- 6.2 Stream Crossings -"a. Road, pipeline, and utility crossings of anadromous fish streams shall be minimized and consolidated at single locations to reduce multiple impacts to both watersheds and individual stream channels. In addition, stream crossings shall minimize areas of disturbance. b. All bridges and culverts installed shall be large enough to provide for the free passage and spawning activities of anadromous fish and shall be positioned to minimize changes in the direction or velocity of stream flow." 3-4
- 12.4 Bank Stabilization-"All bank cuts, fills and exposed earthwork adjacent to a wetland or waterbody must be stabilized to prevent erosion and sedimentation which may occur during or after construction." 3-4
- 13.2 Storage of Petroleum and Petroleum Products-Fuel and oil storage must be at least 100 ft. away from anadromous streams. 3-5

OHMP will issue a letter of concurrence to the Forest Service upon receipt of final plans and specifications. Under the Memorandum of Understanding between the ADF&G and the U.S. Forest Service (98 MOU-10-011), the Forest Service would be issued a letter of concurrence rather than a Fish Habitat Permit. The letter of concurrence will address the same Title 41.14.840 and 41.14.870 concerns as are typically carried on a Fish Habitat Permit.

Thank you for the opportunity to comment on this project. Please contact Habitat Biologist Tammy Massie at 269-6936 or tammy_massie@dnr.state.ak.us with any questions or concerns.

cc: √ D. Blanchet, USDA-FS
T. Rumfelt, DEC
D. Bevington, KPB
J. Selinger, ADF&G/WC
W. Dolezal, ADF&G/SF
K. Gaskill, DNR/DMLW
D. Kelley, DNR/DMLW
D. Cooper, USDA-FS, Seward Ranger District

| Comment | Response |
|---|---|
| 3-1 | The Forest is continuing to pursue an agreement for access on the Hauns Trust Lands. |
| 3-2 | The additional BMP's have been included in the Mitigation section of Chapter 2. |
| 3-3 | This section has been corrected with the information you provided. |
| 3-4 | The additional construction practices recommended have been included in the Mitigation section of Chapter 2. |

**WMHOSS@aol.com**

04/26/2004 09:49 AM

To
dblanchet@fs.fed.us
cc

Subject
Reserrection Creek work

I come to hope each year, to do recreational prospecting at the creek. We are from Illinois an enjoy the 2 weeks that we spend there. We spend approximately $2-3000.00 each year as a tourist in Hope. 4-1

If we could not prospect in the creek, then we would be forced to consider other locations north of Anchorage.

Wayne Molitor

| Comment | Response |
|---|---|
| 4-1 | We have developed a range of options for leaving portions of the project area open or closed to recreational mining in the Alternatives. The effects of the various alternatives to recreational miners are displayed on pages 129-138 of the Draft Environmental Impact Statement. The analysis does include the potential displacement of gold panners to other areas of the Forest. |

**KENAI PENINSULA BOROUGH**
144 N. BINKLEY • SOLDOTNA, ALASKA • 99669-7599
BUSINESS (907) 262-4441 FAX (907)262-1892

DALE BAGLEY
MAYOR

May 13, 2004

State of Alaska
Department of Natural Resources
Office of Project Management and Permitting
550 West 7th Avenue, Suite 1660
Anchorage, Alaska 99501

Attention: Susan Magee, Project Review Coordinator

RE: AK 0404-06AA, Resurrection Creek Stream and Riparian Restoration Project; Start of NEPA Review

Dear Ms. Magee:

Kenai Peninsula Borough (KPB) Coastal District staff reviewed the Draft Environmental Impact Statement (DEIS) submitted by the USFS for the above mentioned project. This project is located along a 0.9-mile segment of Resurrection Creek, located five miles upstream of Hope, within T09N, R2W, S21, Seward Meridian, Alaska.

The U.S. Forest Service (USFS), Chugach National Forest (CNF) is proposing to restore Resurrection Creek's channel, floodplain, and streamside vegetation to pre-mining conditions to enhance fish and riparian wildlife habitat. Historic placer mining operations straightened the stream and separated it from its natural floodplain. These impacts degraded fish rearing and spawning habitat, and affected the adjacent wildlife riparian habitat for species such as bears and eagles.

The focus of this ACMP review is to identify the significant issues related to the proposed project to satisfy the requirements of the National Environmental Policy Act (NEPA).

The CNF proposes to accelerate the recovery of riparian areas along the creek where historically placed tailings (placer deposits from hydraulic mining in the early 1900's) area acting to disrupt the natural function of Resurrection Creek (increased water velocities due to channel constriction, loss of floodplain value, etc.).

Both anadromous and resident fishes utilize the creek. Noting that this project proposes to use tracked, mechanized equipment move gravels and dikes, if the project activities are conducted so as to minimize impacts to all life phases for the fishes, no fuel storage is

5-1

AK 0404-06AA
Resurrection Creek Restoration Project
NEPA Review
USFS

5-1

going to occur within 100 feet of the creek, and the State Historic Preservation Office is proactively consulted concerning the project, then the Kenai Peninsula Borough Coastal District has no objection to the described project.

Thank you for the opportunity to comment.

Sincerely,

Daniel Bevington
Coastal District Coordinator

CC: Dave Blanchet, USFS/CNF
**(Electronic Only:)**
Karlee Gaskill, DNR
Stewart Seaberg, DNR
Lee McKinley, DNR
Robin Willis, DFG
Wayne Dolezal, DFG
Dave Ryland, DFG
Fran Roche, DEC
Tim Rumfelt, DEC
Suzanne Fisler, DNR
Jane Gabler, KPB
John Czarnezki, KPB
Phil North, EPA
Lynnda Kahn, USFWS
Jack Hewitt, USACE
Julie Raymond-Yakoubian, DNR
Cynthia Zuelow-Osborne, OPMP
Holly Babcock, Kenai River Center

Page 2 of 2

| Comment | Response |
|---|---|
| 5-1 | Project design features, and mitigations are planned to minimize impacts to all life phases of fisheries. Use of BMP W-4 in the fisheries mitigation prohibits fuel storage within 100 feet of the creek. Consultation with the State Historic Preservation Office for this project is ongoing. |

# STATE OF ALASKA

**DEPARTMENT OF NATURAL RESOURCES**
*OFFICE OF PROJECT MANAGEMENT AND PERMITTING*
*ALASKA COASTAL MANAGEMENT PROGRAM*

***FRANK H MURKOWSKI***
***GOVERNOR***


■ SOUTHCENTRAL REGIONAL OFFICE
550 W 7th AVENUE SUITE 1660
ANCHORAGE, ALASKA 99501
PH: (907) 269-7470 FAX: (907) 269-3891

□ CENTRAL OFFICE
302 GOLD STREET, SUITE 202
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□ PIPELINE COORDINATOR'S OFFICE
411 WEST 4th AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501
PH: (907) 2857-1351 FAX: (907) 272-3829


May 25, 2004

Mr. Dave Blanchet, Project Coordinator
USDA Forest Service
Seward Ranger District
Chugach National Forest
3301 C Street, Suite 300
Anchorage, AK 99503

Dear Mr. Blanchet:

Subject: DEIS Resurrection Creek Stream and Riparian Restoration Project
State I.D. No. AK 0404-06AA
NEPA Response

The Office of Project Management & Permitting (OPMP) received the Draft Environmental Impact Statement for your proposed project and requested NEPA comments from State resource agencies in order to provide you with a consolidated State response. The proposed activity affects the coastal zone of Alaska, and therefore will also require a review for consistency with the Alaska Coastal Management Program (ACMP); therefore I requested that resource agencies and the affected coastal district also preliminarily address potential ACMP consistency issues in their comments.

Proposed Action:

The Chugach National Forest proposes to accelerate the recovery of riparian areas, and fish and wildlife habitat by restoring a 0.9 mile segment of Resurrection Creek. The area affected by the proposal includes portions of Resurrection Creek where placer deposits were mined using high-pressure water jets (hydraulic mining) during the first three decades of the 1900's. Most of the disturbance impacts relate to hydraulic mining. Tailings generated from hydraulic mining are nearly 40 feet high, bisect and or occupy the majority of the alluvial valley bottom within the project area. These tailings have disconnected or buried the historic complex of stream channels and wetlands that provided high quality habitat for salmon bears, bald eagles, moose and other fish and wildlife species. The Resurrection Creek watershed is located in the Kenai Peninsula in south-central Alaska near the community of Hope. It is a tributary to the Turnagain Arm of Cook Inlet. The watershed covers 103,230 acres (161.2 sq. mi.) within the Western Kenai Mountains Eco-section, a subsection of the Kenai Mountains Section (East ½ of Section 21, T9N, R2W, Seward Meridian).

Mr. Dave Blanchet
Resurrection Creek Restoration Project

OPMP received comments from the Alaska Department of Natural Resources, Division of Mining, Land and Water (DMLW) and the Office of Habitat Management & Permitting (OHMP); the Alaska Department of Environmental Conservation (ADEC), and the Kenai Peninsula Borough (KPB) Coastal Resource District. A summary of the comments follows. Copies of the comments are also enclosed.

DNR, Division of Habitat Management & Permitting (OPMP):

OHMP supports this fish habitat restoration project and the rehabilitation of spawning and rearing habitat for anadromous fish in Resurrection Creek.

With the exception of Alternative 1 (No action), all of the alternatives will restore Resurrection Creek by removing and regrading tailings piles, increasing the amount of large woody debris in the stream, restoring stream meanders and complexity, and increasing the diversity of the riparian vegetation. Differences between the alternatives consist of length of the restored segments, the amount of interpretive work done, road, trail, and equipment access to the restoration area, and areas of the stream closed to recreational mining.

The preferred alternative (Alternative 4) would include restoring 0.9 miles of Resurrection Creek on Forest Service lands; accessing these lands through the Resurrection Pass Trail easement on the Haun Trust lands; construction of 3 bridges; construction of 0.35 miles of new road to shift Palmer Creek Road out of the floodplain; construction/improvement to approximately 0.4 miles of road to facilitate trail use; a closure order restricting mining activities in the restoration area; installation of three interpretative panels construction of a new parking area; and rerouting and subsequent restoration of Resurrection Pass Trail.

OHMP understands the difficulty of securing access to private land, which may necessitate the use of Alternative 4. However, should access become available; we would encourage use of one of the alternatives (e.g. Alternative 2 or a combination of Alternatives 2&3) that allows the maximum amount of restoration with a reduced amount of road and bridge construction.

Invasive and prolonged nature of heavy equipment use on this project increases the importance of using best management practices (BMP) and good planning to prevent damage by equipment. The BMPs described in Chapter 2 "Mitigation Common to All Alternatives" should be implemented to prevent fuel contamination from use, maintenance, and presence of vehicles in the floodplain and streambed areas. These BMPs will also limit sedimentation and erosion from construction activities. In addition, OHMP would suggest the following mitigation measures:

1. The number of stream crossings should be minimized and be done during the winter or at locations that will be restored as part of the larger project. Stream crossings should be made from bank to bank in a direction substantially perpendicular to the direction of stream flow.

2. Bridges should be clear span structures with abutments sufficiently offset from the ordinary highwater line to preclude armoring of the bank to protect the structure.

3. Effectiveness of mitigation techniques should be reviewed at the end of each construction seasons and improvements, if applicable, incorporated into plans for next season.

4. In-water work areas for bridge construction and removal should be isolated from the flowing waters of Resurrection and Palmer Creeks with silt curtains or similar techniques to control sedimentation.

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Mr. Dave Blanchet
Resurrection Creek Restoration Project

5. Work areas for road/parking construction, tailings sorting, timber harvesting, and soil and tailings removal and placement should be isolated from Resurrection and Palmer Creeks with silt fences or similar devices to prevent sedimentation of the surface waters.

OHMP is willing to coordinate with the Forest Service and potentially close segments of Resurrection Creek to recreational gold mining/suction dredging in order to protect restoration efforts.

***Page specific comments for DEIS***
Chapter 1, 2nd paragraph under "Permits, Licenses and other Entitlements" Pg 10-
Sections 840 and 870 are reversed. Section 870 is for the protection of anadromous fish and Section 840 is for the protection of resident fish passage.

Chapter 3, 3rd paragraph under "Brown Bear" Pg 102-
The ADF&G contact for brown bear information in Game Management Unit 7 is Wildlife Biologist Jeff Selinger (907-262-9368).

OHMP will issue a letter of concurrence to the Forest Service upon receipt of final plans and specifications. Under the Memorandum of Understanding between the ADF&G and the U.S. Forest Service (98 MOU-10-011), the Forest Service would be issued a letter of concurrence rather than a Fish Habitat Permit. The letter of concurrence will address the same Title 41.14.840 and 41.14.870 concerns as are typically carried on a Fish Habitat Permit.

DNR, Division of Mining Land and Water:

DNR/DMLW has determined that due to their hydrological characteristics, the portion of Resurrection Creek located in Sections 21 and 28 of T9N, R2W, SM, and the portion of Palmer Creek in Section 21 are navigable, and as such, the State asserts ownership of the creek beds. The proposed activities occurring within State owned land requires a Temporary Land Use Permit.

The re-routing of the primary corridor and the introduction of side channels should be accomplished in a manner that will not diminish the navigability of the waterbody, or impair or impede the ability of the public to navigate the waterbody.

The fallen trees and resultant debris should be placed in the waterbody in a manner that will not impede or impair the ability of the public to navigate the waterbody.

Taking materials from below the ordinary highwater mark of Resurrection Creek and relocating the material onto land not owned by the state will require a material sale contract.

The Alaska Department of Environmental Conservation:

ADEC advises the U.S. Forest Service to coordinate the proposed sediment sampling with the ADEC Contaminated Sites Program to insure that they are sampling for the right mercury components. Jim Frechione is the contact for ADEC (269-7658). The Forest Service has indicated that it plans to monitor for mercury resulting from past mining efforts. ADEC recommends that sampling only needs to be done in areas of the stream that will be impacted by the restoration activity and contain backwater eddies where said sediment could have settled out. ADEC's concerns are with the movement of sediment that may contain levels of contamination above their clean up levels. The sampling would show if such sediments

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Mr. Dave Blanchet
Resurrection Creek Restoration Project

exist, and if so, then ADEC will need to approve proposed work which may impact these sediments and their movement.

Alaska Coastal Management Program Comments

DNR/OHMP:
Restoration of fish habitat and the improvement of riparian habitat for other species are certainly consistent with the intent of the Alaska Coastal Management Program's Habitats Standard 6 AAC 80.130 and with Administrative Policy A8 "Fish Habitat Improvement" of the Kenai Peninsula Borough Coastal District. Construction practices should be specifically reviewed for consistency with the Kenai Peninsula Borough Coastal District Plan policies on equipment use in the floodplain and harvest of riparian vegetation. District Enforceable policies that may be relevant and have not already been addressed by the DEIS are:

- 2.4 Dredging and Filling- for the minimization of waterborne sediment.
- 6.2 Stream Crossings -"a. Road, pipeline, and utility crossings of anadromous fish streams shall be minimized and consolidated at single locations to reduce multiple impacts to both watersheds and individual stream channels. In addition, stream crossings shall minimize areas of disturbance. b. All bridges and culverts installed shall be large enough to provide for the free passage and spawning activities of anadromous fish and shall be positioned to minimize changes in the direction or velocity of stream flow."
- 12.4 Bank Stabilization-"All bank cuts, fills and exposed earthwork adjacent to a wetland or waterbody must be stabilized to prevent erosion and sedimentation which may occur during or after construction."
- 13.2 Storage of Petroleum and Petroleum Products-Fuel and oil storage must be at least 100 ft. away from anadromous streams.

Kenai Peninsula Borough Coastal Resource District:

The Kenai Peninsula Borough has no objections to the proposed project providing the project activities are conducted so as to minimize impacts to all life phases for the fishes, no fuel storage is going to occur within 100 feet of the creek and the State Historic Preservation Office is proactively consulted concerning the project.

OPMP appreciates the opportunity to provide State NEPA comments and to preliminarily identify the ACMP issues that were noted by the commenting agencies. Please note that in accordance with 15 CFR 930.36(a)(b), federal agencies shall review their proposed activities which affect any coastal use or resource in order to develop consistency determinations which indicate whither such activities will be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of approved management programs. The appropriate timing for the submission of a consistency determination is at least 90 days before final approval of the Federal agency activity, unless both the Federal agency and the State agency agree to an alternative notification schedule. The State of Alaska and USFS Memorandum of Understanding, section 204, establishes procedures for coordinating the consistency review comment period with the EIS NEPA comment period.

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Mr. Dave Blanchet
Resurrection Creek Restoration Project

Please contact me at (907) 269-7472 or at susan_magee@dnr.state.ak.us, if you have any questions about your consistency determination or the ACMP. Please note that the ACMP Statewide Standards and district enforceable policies are available on our website at www.alaskacoast.state.ak.us.

Sincerely,

Susan E. Magee
Project Review Supervisor

Enclosures

Distribution List:

Stefanie Ludwig, DNR/SHPO
Karlee Gaskill, DNR/DMLW
Stewart Seaberg/Tammie Massie, DNR/OHMP
Tim Rumfelt, DEC
Wayne Dolezal/Dave Ryland, DFG
Dan Bevington, KPB

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mailbox:///C|/Documents%20and%20Settings/SMAGEE/Applicati...

**Subject:** [Fwd: Resurrection Creek]
**From:** Karlee Gaskill <karlee_gaskill@dnr.state.ak.us>
**Date:** Thu, 06 May 2004 14:22:12 -0800
**To:** Susan Magee <susan_magee@dnr.state.ak.us>

Sue, I am forwarding Dave Kelley's comments regarding the Resurrection Creek project. kg

--

Karlee Gaskill, Natural Resource Specialist, DNR MLW/SCRO
550 W. 7th Avenue, Ste. 900C, Anchorage, AK 99501
Phone: 907-269-8553, Fax: 907-345-8913
Email: karlee_gaskill@dnr.state.ak.us

---

**Subject:** Resurrection Creek
**From:** Dave Kelley <dave_kelley@dnr.state.ak.us>
**Date:** Wed, 05 May 2004 11:44:27 -0800
**To:** "Gaskill, Karlee" <karlee_gaskill@dnr.state.ak.us>

The re-routing of the primary corridor and the introduction of side channels should be accomplished in a manner that will not diminish the navigability of the waterbody, or impair or impede the ability of the public to navigate the waterbody.

The fallen trees and resultant debris should be plaed in the waterbody in a manner that will not impede or impair the ability of the public to navigate the waterbody.

Taking materials from below the oridnary highwater mark of Resurrection Creek and relocating the material onto land not owned by the state will require a materail sale contract.

Please find attached a letter regarding Resurrection Creek and the state's navigability determination.

Dave Kelley
Southcentral Region, Land Office, Division of Mining, Land & Water
Department of Natural Resources

7-1

# STATE OF ALASKA

**DEPARTMENT OF NATURAL RESOURCES**

*DIVISION OF MINING, LAND AND WATER*

*FRANK H. MURKOWSKI, GOVERNOR*

*RESOURCE ASSESSMENT*
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March 16, 2004

**State Navigability Determinations**
**for Portions of Resurrection Creek**
**and Palmer Creek** (Seward D-8)

In preparation for a stream restoration project for two creeks in the Chugach National Forest, Resurrection Creek and Palmer Creek, the Forest Service needs to understand the State's permit requirements for the proposed project. Dave Kelley, with Alaska's Department of Natural Resources' Division of Mining, Land and Water (ADNR – DMLW), has stated that the project would require a Temporary Land Use Permit if parts of the project are situated on State lands. The Forest Service has inquired about the State's position on the navigability of Resurrection and Palmer Creeks so they can determine what permits the State may require.

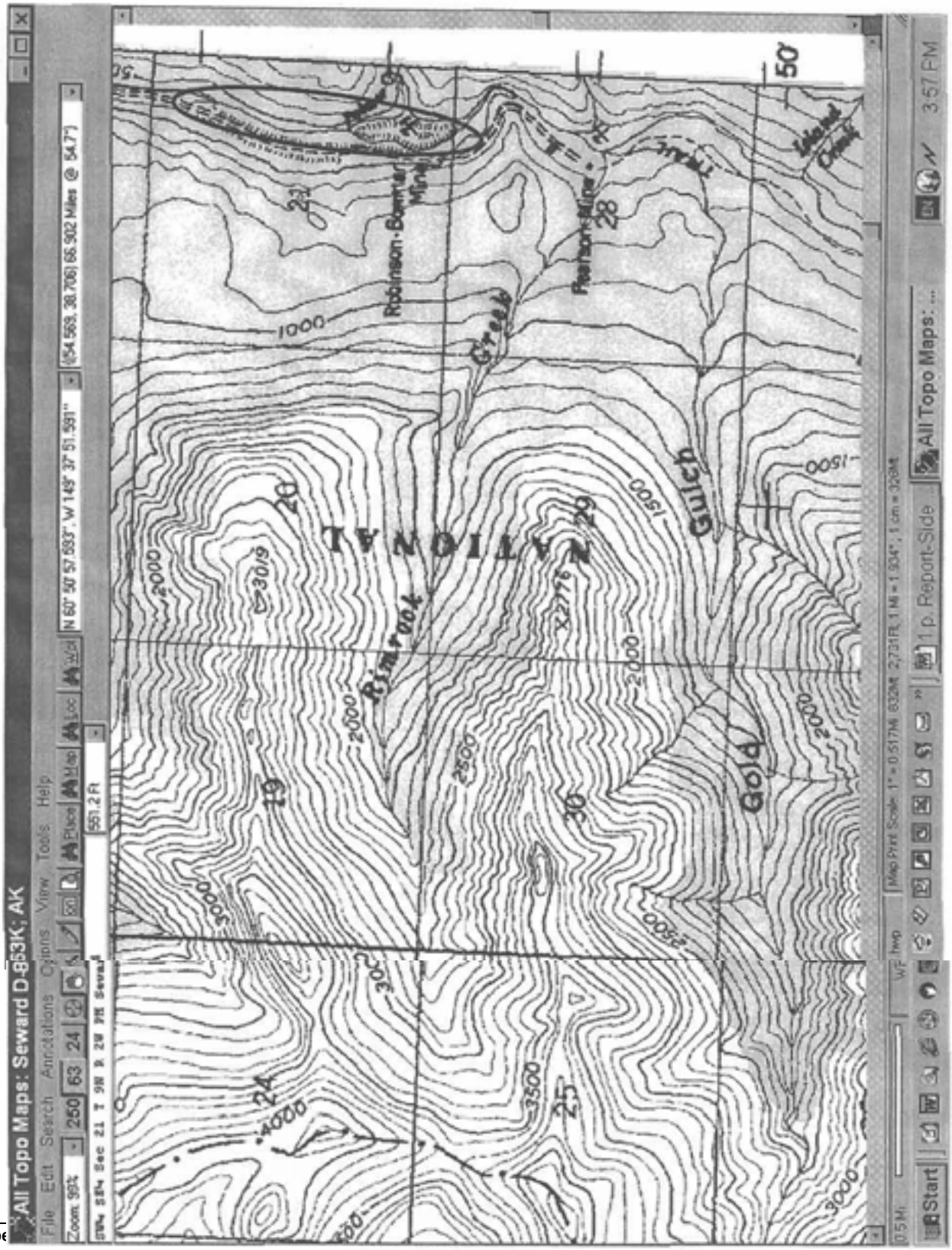
Due to their hydrological characteristics, the portion of Resurrection Creek located in Sections 21 and 28 of T. 9 N., R. 2 W., S.M., and the portion of Palmer Creek in Section 21 are determined by the State of Alaska to be navigable. Therefore, permits should be obtained from the State, the legal owner of the creek beds. A Temporary Land Use Permit should be obtained from ADNR's Southcentral Regional Office. In addition, because these two streams are anadromous, ADNR's Office of Habitat Management and Permitting should be contacted and any necessary permits obtained. These two streams contain Pink Salmon, Dolly Varden, Coho Salmon and King Salmon. The ADF&G number for Resurrection Creek is 10150 and for Palmer Creek, it is 10150-2025. 7-2

At this location, Resurrection Creek is 60 feet wide and 1½ feet deep; there is a USGS stream gauge approximately 4 miles downstream. In Section 21, Palmer Creek is 25 feet wide and 1 foot deep and there are currently some boulders in the water. The gradient of both of these streams varies from 1.5% to 2.6%. Because these creeks are navigable, the State owns the beds. Title to the beds of all navigable waters passed to the State of Alaska at Statehood based on the Equal Footing Doctrine, the Submerged Land Act of May 22, 1953, P.L. 83-31, 67 Stat. 29, 43 U.S.C. Sections 1301 et seq., and the Alaska Statehood Act of July 7, 1958, P.L. 85-508, 72 Stat. 339, 48 U.S.C. note preceding Section 21.

Kathy Atkinson

Kathy Atkinson, Esq.
DNR Navigability Program Manager
Resource Assessment & Development Section
Division of Mining, Land & Water
Department of Natural Resources

*Page 1 of 2*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| Comment | Response |
|---|---|
| 7-1 | Construction techniques to maintain the navigability of Resurrection and Palmer Creeks has been added to the mitigation section of Chapter 2. |
| 7-2 | Since the State had determined Resurrection and Palmer Creeks to be navigable, the Permits, Licenses, and other Entitlements portion of Chapter 1 has been updated to show that a Temporary Land Use permit would be necessary to implement the project. |

file:///C|/Documents%20and%20Settings/SMAGEE/Applicat...

**Subject:** RE: Resurrection Creek Restoration, AK 0404-06AA
**From:** "Rumfelt, Tim" <tim_rumfelt@dec.state.ak.us>
**Date:** Thu, 13 May 2004 11:40:23 -0800
**To:** 'Susan Magee' <susan_magee@dnr.state.ak.us>
**CC:** "Frechione, Jim" <Jim_Frechione@dec.state.ak.us>, "Rumfelt, Tim" <tim_rumfelt@dec.state.ak.us>

Sue, as we discussed with Dave Blanchett at the recent meeting, USFS needs to coordinate their proposed sediment sampling with the ADEC Contaminated Sites Program, Jim Frechione 269-7658, to insure that they are sampling for the right mercury components. As you recall, USFS plans to monitor for mercury resulting from past mining efforts. Sampling only needs to be done in areas of the steam that will be impacted by the restoration activity and contain backwater eddies where said sediment could have settled out. ADEC's concerns are with the movement of sediment that may contain levels of contamination above our clean up levels. The sampling would show if such sediments exist, and if so, then we will need to approve proposed work which may impact these sediments and their movement. 8-1

Tim

-----Original Message-----
from: Susan Magee [mailto:Susan_Magee@dnr.state.ak.us]
Sent: Wednesday, May 12, 2004 2:47 PM
To: Daniel Bevington; Tammy M Massie; Rumfelt, Tim; David B Ryland; Stefanie L Ludwig
Cc: Cartwright, Candace
Subject: Resurrection Creek Restoration, AK 0404-06AA

Reviewers:
Please note that NEPA/preliminary ACMP comments regarding the above project are due May 13, 2004. Your response is requested so that we can provide the USFS with a collective State response by the DEIS comment deadline. Please let me know if you have any questions.
Thank you,
Sue
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Susan E. Magee
Project Review Supervisor
Alaska Coastal Management Program
Office of Project Management and Permitting
Alaska Department of Natural Resources
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Anchorage, AK 99501
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| Comment | Response |
|---|---|
| 8-1 | Additional mitigation measures have been added to the Mercury section of the Mitigation Measures in Chapter 2 as suggested. Additional information regarding mercury has been added to the Aquatic Resources and Hydrology sections of Chapter 3. |