



ENVIRONMENTAL ASSESSMENT
Shamrock Group Mining Plan of Operations
June, 2013

Comments may also be submitted in writing to:

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ABBREVIATIONS

AKNHP	Alaska Natural Heritage Program
ANILCA	Alaska National Interest Lands Conservation Act
ATV	All-Terrain Vehicle
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DEC	Alaska Department of Environmental Conservation
EA	Environmental Assessment
EIS	Environmental Impact Statement
MPO	Mining Plan of Operations
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NP/P	National Park and Preserve
NPS	National Park Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
ORV	Off Road Vehicle
ROD	Record of Decision on an EIS
RWCA	Right of Way Certificate of Access
UNESCO	United Nations Educational, Scientific, and Cultural Organizations
USFWS	United States Fish and Wildlife Service
USEPA	United States Environmental Protection Agency
WRST	Wrangell-St. Elias National Park and Preserve

1.0 INTRODUCTION

1.1 PURPOSE AND NEED

The National Park Service (NPS) is considering approval of a mining plan of operations (MPO) which was submitted by Thomas and Kathryn Lamal (Lamal) for the purpose of accessing and conducting a suction dredge placer gold mining operation on the Shamrock Group unpatented mining claims located in the Gold Hill area within the preserve of Wrangell-St. Elias National Park and Preserve (WRST). Lamal, the claimant and operator of the claims, submitted a Mining Plan of Operations (MPO) in November 2012 after consultation with NPS geologists, as required by Title 36 of the Code of Federal Regulations (CFR), Part 9A, Section 9.9, detailing their proposed means and methods. Copies of the lengthy MPO are available in NPS offices in Copper Center and Anchorage per Federal Register Notice of February 27, 2013 (Vol. 78, No. 39, Pg 13379). Lamal also submitted a SF-299 application in February 2013 for ANILCA 1110(b) access to the Shamrock Group.

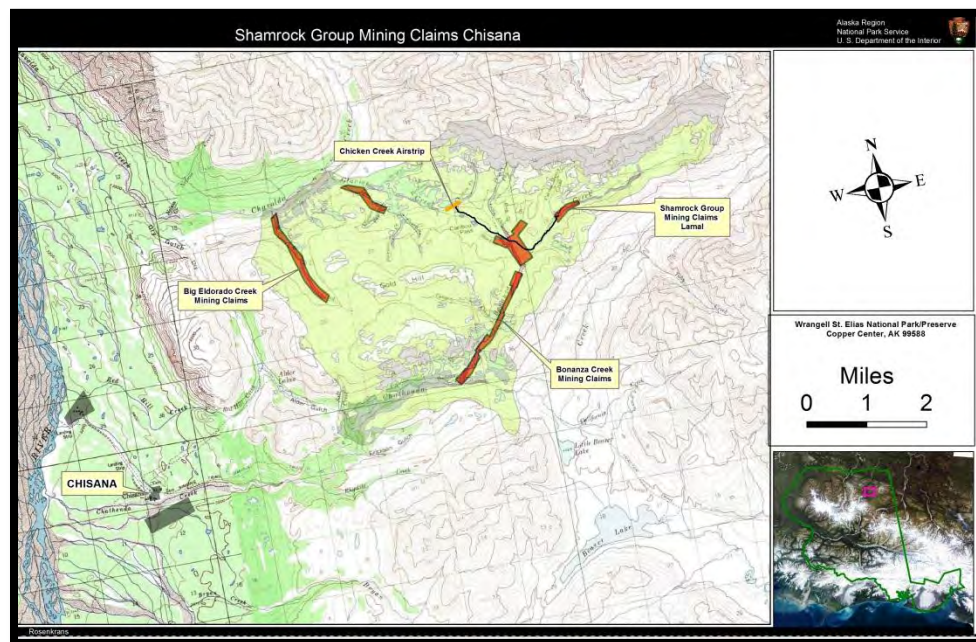


Figure 1: Chisana-Gold Hill Area Map

The mineral rights to the Shamrock Group claims (Shamrock #AA0026813 and Tony M #AA0026810) are owned by the Lamal's. This environmental assessment (EA) examines and analyzes the proposed mining operations and reasonable alternatives to ensure that it satisfies the requirements of 36 CFR 9.10, and would not injure or adversely affect federally owned land.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council of Environmental Quality (40 CFR 1508.9), the Mining in the Parks Act of 1976 and its implementing regulations (36 CFR 9A), as well as ANILCA 1110(b). The surface of the claims has been disturbed for the purposes of mineral extraction prior to 1977.

1.2 BACKGROUND

Prospectors first discovered gold in Bonanza Creek in 1913. This led to the Chisana Gold Rush with mineral exploration and placer mining along Big Eldorado, Little Eldorado, Gold Run and Bonanza Creek drainages during the 1913-1919 period. Subsequently, in the 1930's hydraulic mining occurred in Bonanza Creek and along upland benches. The Shamrock Group placer mining claims were located June 30, 1970 approximately 10 years before the establishment of WRST.



Figure 2: Upper Bonanza Creek Drainage, Shamrock and Tony M Placer Claims above Confluence with Coarse Money Creek

These claims are unpatented, were previously mined and encompass approximately 28.7 acres. Historic mining directly impacted 131 acres of lands in the Gold Hill area including more than 9 acres that were mined within the Shamrock Group (NPS, 1990). Physiographic environments that were most affected by past mining include the stream channel, floodplain, stream terraces and some upland benches located in and along the drainage bottoms. No mining operations have been conducted or approved by the NPS on the Shamrock Group since WRST was established. Most of Bonanza Creek stream bed from its confluence with Chathenda Creek to its upper reaches has been disturbed or mined; some sections were disturbed three or more times. Virtually all stream bottoms have been affected and many adjacent upland benches have also been mined or otherwise developed. Chisana miners employed hydraulic methods and major water diversions projects were common. Miners also used mechanized equipment in the district. The amount of mining activity at Gold Hill has fluctuated with the price of gold; this district has been an intermittent producer. Gold production between 1913 and 1942 at Gold Hill is estimated at 45,000 ounces. Though there is no accurate estimate of recent gold production, it is likely that another 10,000 to 20,000 ounces have been produced since 1942.

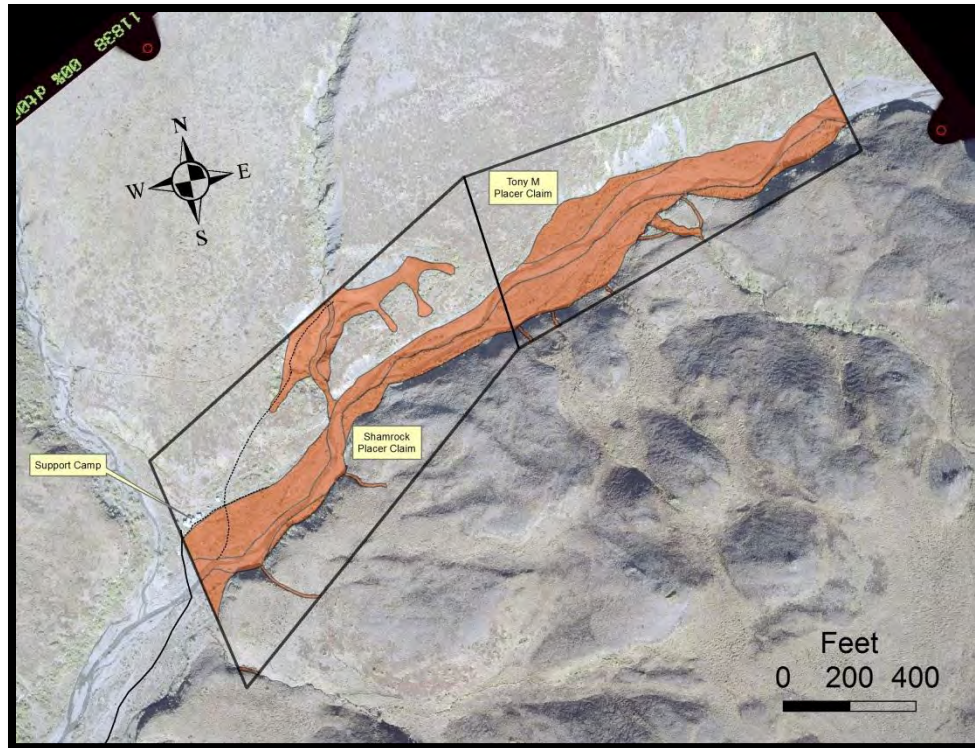


Figure 3: Shamrock Group Previously Disturbed Areas

The current claimants of record acquired the Shamrock Group placer claims in 2005 from the Carolyn and Lloyd Webb; Ivan Thorall was the original claimant of record. The NPS issued Thorall a permit to mine in 1985 on the Shamrock and Tony M Claims. He posted a performance bond that was relinquished in 1989. It appears as if Ivan Thorall intermittently mined these claims starting in the 1970s but ceased activities in the late 1980's. The BLM conducted field mineral examinations of the subject property in 2010; the NPS anticipates that the "Mineral Report - Validity Examination of Shamrock and Tony M Federal Placer Mining Claims" will be approved during 2013. The NPS minerals management program is guided by the 1990 WRST Mining EIS record of decision (ROD). That ROD preferred approach for minerals management is to acquire all mining claims located within WRST from willing sellers. The Shamrock Group claimants of record have not expressed an interest in selling the claims to the NPS. Hence, the NPS is directed to process proposed Mining Plan of Operations (MPO) and authorize those MPOs which would not result in significant impact to park resources and values.

Lamal developed and subsequently submitted a draft Mining Plan of Operations to the NPS for placer mining operations on the Shamrock Group in November 2012. The NPS determined that Lamal's MPO was essentially complete, and published a "Notice of Availability" for the MPO in the Federal Register on February 27, 2013.



Figure 4: Historic Placer Mining on Bonanza Creek near Shamrock Group about 1915

1.3 PARK PURPOSE AND SIGNIFICANCE

President Jimmy Carter established Wrangell-St. Elias National Monument by executive order in 1978. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) designated Wrangell-St. Elias National Monument and adjoining Kluane National Park in Canada as a World Heritage Site on October 26, 1979, recognizing their significant natural landscapes. Congress expanded the national monument in 1980, designating the enlarged area as Wrangell-St. Elias National Park and Preserve (WRST) under the Alaska National Interest Lands Conservation Act (ANILCA). WRST encompasses approximately 13.2 million acres, a significant portion of Alaska's south-central region (Bleakley, 2000).

ANILCA Section 201(a), states that the park/preserve will be managed for the following purposes, among others:

to maintain unimpaired the scenic beauty and quality of high mountain peaks, foothills, glacial systems, lakes and streams, valleys, and coastal landscapes in their natural state; to protect habitat for, and populations of, fish and wildlife including but not limited to caribou, brown/grizzly bears, Dall's sheep, moose, wolves, trumpeter swans and other waterfowl, and marine mammals; and to provide continued opportunities, including reasonable access for mountain climbing, mountaineering, and other wilderness recreational activities. Subsistence uses by local residents shall be permitted in the park, where such uses are traditional in accordance with the provisions of title VIII.

1.4 LAWS, REGULATIONS AND POLICIES

1.4.1 General Mining Act of 1872 (30 USC 21 et. Seq.)

The General Mining Act of 1872 authorized and governed prospecting and mining for economic minerals, such as gold, platinum, and silver, on federal public lands. This law codified the previously informal

system of acquiring and protecting mining claims on public lands. All United States citizens 18 years or older have the right under the 1872 mining law to locate lode (hard rock) or placer (gravel) mining claims on federal lands open to mineral entry, and such claims may be recorded once a local mineral discovery is made. The Shamrock Group unpatented placer mining claims were originally located under the terms of this Act.

1.4.2 NPS Organic Act and General Authorities Act

The NPS Organic Act of 1916 directed the Secretary of the Interior and the NPS to manage national parks and monuments to

conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

The NPS Organic Act also granted the Secretary of the Interior the authority to implement “rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service (16 USC 3).”

The General Authorities Act of 1970 and amendments to the NPS Organic Act passed in 1978 expressly communicated the role of the national park system in ecosystem protection. The amendments further reinforce the primary mandate of preservation by stating:

The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the national park system and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided for by Congress (16 USC 1-a1).

In addition, the NPS Organic Act and General Authorities Act prohibit the impairment of park resources and values. The 2006 NPS Management Policies use the terms “resources and values” to mean the full spectrum of tangible and intangible attributes for which the park is established and managed, including the NPS Organic Act’s fundamental purpose and any additional purposes as stated in the park’s enabling legislation. The park resources and values are intended to be managed so that they continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

1.4.3 Mining in the Parks Act of 1976 (PL 94-429)

The Mining in the Parks Act of 1976 closed six national park systems units to mineral entry following a congressional finding that if the application of the United States mining laws was not discontinued, they would conflict with the purposes for which individual parks units were established. Congress also directed that all mining operations in national parks should be conducted in a manner which prevents or minimizes damage to the environment and other park resources. Consequently, the Act also authorized the Secretary of the Interior to regulate mining and associated activities on federal mining claims located within park units. These regulations, found at 36 CFR Subpart 9A, apply to both patented and valid unpatented mining claims.

1.4.4 Presidential Proclamation 4625

On December 1, 1978, President Jimmy Carter, acting under authority granted by the Antiquities Act of 1906, issued Proclamation 4625, which established Wrangell-St. Elias National Monument to preserve 10,950,000 acres of land in south central Alaska possessing significant geological, ecological, biological, archeological, and historic features. While the new monument remained subject to valid existing rights, including mining claims located under the Mining Act of 1872, the proclamation withdrew all its lands from further mineral entry.

1.4.5 Alaska National Interest Lands Conservation Act of 1980 (PL 96-487)

On December 2, 1980, the U.S. Congress passed the Alaska National Interest Lands Conservation Act (ANILCA), enlarging and re-designating Wrangell-St. Elias National Monument as Wrangell-St. Elias National Park and Preserve. ANILCA gave the NPS the authority to administer the lands and interests within the park pursuant to the provisions of the National Park Service's Organic Act of August 25, 1916, as amended (16 USC.1), and other pertinent legislation. Like Proclamation 4625, ANILCA closed the park to mineral location under the existing mining laws (16 USC. 410hh-5).

1.4.6 1990 Wrangell-St. Elias National Park and Preserve Cumulative Impacts of Mining EIS and ROD

As a result of a 1985 lawsuit filed by a group of environmental organizations, the U.S. District Court found that the NPS in Alaska had not fully complied with the 1976 The Mining in the Parks Act and the 1969 National Environmental Policy Act. The Court ordered the NPS to prepare an Environmental Impact Statement (EIS) on the cumulative impacts of multiple mining operations within each of three Alaska park units, including Wrangell-St. Elias National Park and Preserve, and enjoined the NPS from permitting mining operations prior to completion and Court approval of the EIS. As a result of actions proposed in WRST's EIS, the NPS submitted a Record of Decision (ROD) to the Federal Court recommending acquisition of all patented and valid unpatented mining claims. However, the ROD (signed August 21, 1990) also stipulated that until such time as sufficient funds were available for acquisition, the NPS would continue to process mining plans of operations according to 36 CFR 9A - Mining and Mining Claims, 43 CFR Part 36 - Transportation and Access Into Conservation System Units in Alaska and approve those plans that meet regulatory requirements. On December 28, 1990, the Federal Court approved the findings of the EIS (NPS 1990). Congress subsequently appropriated funds for acquisition of mining claims in WRST, and the NPS has pursued the acquisition of mining claims in WRST from willing sellers since the late 1990s.

1.4.7 Wrangell-St. Elias National Park and Preserve Foundation Statement

WRST's Foundation Statement is a formal description of the park's core mission: a foundation to support planning and management. The foundation is grounded in the park's legislation and from knowledge acquired since the park was established.

The purpose of Wrangell-St. Elias National Park and Preserve is to maintain the natural scenic beauty of the diverse geologic, glacial, and riparian dominated landscapes, and to protect the attendant wildlife populations and their habitats; to ensure continued access for a wide range of wilderness-based recreational opportunities; to provide continued opportunities for subsistence use.

The Foundation Statement also identifies WRST's fundamental themes, among which are living cultures. That category's significance statement notes:

Wrangell-St. Elias National Park and Preserve is an inhabited area where local communities and traditional human activities remain integrated with the wilderness setting.

1.4.8 Wrangell-St. Elias National Park and Preserve Mission Statement

WRST's mission statement reminds park managers to value traditional activities and cooperate with local landowners:

We conserve the ecological integrity and heritage resources of Wrangell-St. Elias National Park and Preserve while providing for public use in a wilderness setting. We serve visitors who seek inspiration, recreation and education and we strive to provide for a quality and safe experience. We value those who live within the park boundaries and those who come to engage in traditional activities, subsistence, or scientific study. We cooperate with local communities, landowners, Alaska Native groups and others who are part of Wrangell-St.

Elias National Park and Preserve in order to address their needs while fulfilling our responsibility to protect natural and cultural resources.

1.5 RELATIONSHIP TO OTHER PLANNING PROJECTS

1.5.1 Relationship to Access to Inholdings

ANILCA Section 1110(b) provides for private landowners to be given “such rights as may be necessary to assure adequate and feasible access for economic and other purposes to the concerned land by such . . . private owner or occupier and their successor in interest,” while such rights would be subject “to reasonable regulations issued by the Secretary to protect the natural and other values of such lands.”

Access to mining claims situated within Alaska parks is governed by the Department of Interior transportation and utility system regulations at 43 CFR Part 36. Section 36.10 of these access regulations specifies procedures for access across park lands to valid inholdings, including patented and valid unpatented claims. Section 36.10(c), allows mining claimants who acquired their rights under the General Mining Act of 1872 to file their request for access as part of their mining plan of operations.

Lamal submitted an SF-299 application for access in February 2013. The NPS Alaska Region utilizes the July 2007 “Interim User’s Guide to Accessing Inholdings in National Park System Units in Alaska” and employs the criteria and processes articulated in Wrangell-St. Elias National Park and Preserve’s (WRST) 2008 “Established and Maintainable Access to Inholdings Programmatic Plan and Environmental Assessment” to describe, analyze and grant the operator an Alaska National Interest Lands Conservation Act (ANILCA), Section 1110(b) Right-of-Way Certificate of Access (RWCA) for access to Shamrock Group to conduct mining operations. A RWCA will include the terms and conditions for use of motorized equipment along a bladed route that serves as an existing ORV trail between Chicken Airstrip and Shamrock as well as the use and maintenance of Chicken Creek Airstrip. The RWCA for Lamal’s access to Shamrock Group to conduct mining operations is shown in Appendix G. Similar RWCA’s could also be granted to other claimants for access to placer mining claims on Little Eldorado and Bonanza Creek.

The direct and indirect environmental effects related to ANILCA Section 1110(b) access are covered in the 2007 “Established and Maintainable Access to Inholdings Programmatic Plan and Environmental Assessment”. NEPA compliance for the Lamal’s access to Shamrock Group to conduct mining operations is tiered to the 2007 document.

1.5.2 Relationship to other Mining Plans of Operations

The National Parks Service has prepared multiple mining and access environmental assessments (EA) related to proposed mining and access activities in the Chisana – Gold Hill Area. These environmental assessments analyzed effects on the environment and are listed below.

- EA - Access to Placer Claims on Big Eldorado Creek and Gold Run and Access route Maintenance to Chicken Airstrip Little Eldorado Trail, WRST: Operations ORVs, trail and airstrip maintenance.
- EA - Mining Claim Validity Examinations 1987 & 1988: Accessing and sampling unpatented mining claims using mining equipment.
- EA - Five Year Plan of Operations on Bonanza Nos. 4, 5 & 6 Placer Claims ,WRST 1989: Access and mining operations analysis.
- EA - Five Year Plan of Operations on Bonanza Creek 1-6 Placer Claims, WRST – 1995: Access and mining operations analysis for suction dredge, highbanker and metal detector mining

operations, and access to Bonanza Creek Claims and Little Eldorado camp with ORVs. Supplemental analysis circa 2000.

- Little Eldorado Creek Trail prescription - 2009: Trail maintenance included ditching, placement of cobbles and geotextiles.
- EA -Ten Year Mining Plan of Operations Big Eldorado Creek Claim Group WRST - 2001: Mechanized and suction placer mining operations. Overland winter access and use of ORVs on existing trails.
- EA - Winter Access Chisana to Horsfeld, WRST – 1991:

1.6 SPECIFIC ISSUES

To focus this environmental assessment, the NPS selected specific impact topics for analysis and eliminated others from further evaluation. Impact topics are defined as any resources in WRST that may be affected by the proposed action. Subsequent discussions of the affected environment and environmental consequences related to each alternative focus primarily on these impact topics (Table 2). A brief rationale for the selection of each topic is given below, as well as the rationale for dismissing specific topics from further consideration.

1.6.1 Issues Selected for Detailed Analysis

Aquatic and Water Resources

The Clean Water Act, the National Environmental Policy Act, and NPS Management Policies direct the NPS to consider an action's potential to affect aquatic resources. Bonanza Creek is one of 3 drainages with unpatented placer claims and historic mining in the Chisana Study Area. There are estimated 42 miles of stream resources (NPS 1990). Bonanza Creek flows into Chathenda Creek (three miles downstream from the claim block), a major tributary to the Chisana River. Proposed mining operations would occur within the Bonanza Creek drainage fluvial system. Potential resources at risk proximal to the claims include invertebrates and water quality.

Placer mining discharge and disturbance directly impacts fluvial systems. Placer mining wastewater discharge would generate elevated levels of suspended sediments which could degrade water quality. Surface disturbance removes soils and vegetation, exposing areas to erosion which could also adversely affect water quality. Improper transportation, use, or storage of fuels used could endanger water quality and dependent resources. Managing and monitoring operations is necessary to minimize or eliminate adverse effects to water quality.

Cultural Resources

The Chisana Historic Mining Landscape is listed on the National Register of Historic Places. Bonanza Creek is associated with the 1913-1914 Chisana Gold Rush. The drainage contains significant elements of the historic mining landscape. Mining operations pose threats to these cultural resources. Loss or degradation of significant resources would adversely affect the historic district. Cultural resource staff have conducted an archeological inventory of this action's area of potential effect (APE) in an effort to identify any remaining historic properties (36 CFR 800.4(b)) pursuant to NHPA, Section 106 (16 USC 470f). NPS staff will provide recommendations to the operator regarding protection and preservation of any historic artifacts or features.

Floodplains

Consideration of impacts on floodplains is required by Executive Order 11988 (“Floodplain Management”). Historic mining operations in the Bonanza Creek have profoundly altered the river corridor area and function of its floodplain and numerous historic mining structures and artifacts are located in the floodplain. The proposed mining operations and associated activity would occur in the existing or historic floodplain.

Socioeconomic Environment

Mining is a commercial operation with the potential to benefit the mine operators, employees and investors directly. Business revenues and employment opportunities could also enhance other local revenue streams, indirectly benefiting the greater socioeconomic community/environment.

Soils

The NPS Organic Act and NPS Management Policies direct the NPS to maintain all the components and processes of naturally evolving park ecosystems, including soils. The proposed mine site encompasses approximately 9 acres, all of which is previously disturbed and currently lacks a discernible soil horizon. Mining would directly and adversely affect some soils, but would generally be confined to either barren ground or gravel bars lacking well developed soils. No new impacts to pristine soils on preserve lands are anticipated.

Vegetation

The NPS Organic Act and *NPS Management Policies* direct the NPS to maintain all the components and processes of naturally evolving park ecosystems, including vegetation. The proposed mining, as well as other future non-mining related development, would directly impact some vegetation within the claim block. Some existing vegetation within the project area would be destroyed, disturbed or lost due to overburden removal and/or mining until successional vegetation is reestablished.

The Federal Noxious Weed Control Act and Executive Order 13112 require federal agencies to analyze the potential to contribute to the introduction, continued existence, or spread of noxious weeds on non-native species or actions that may promote the introduction, growth, or expansion of the range of such species.

Wetlands

Executive Order 11990 (Protection of Wetlands) requires the NPS, and other federal agencies, to evaluate the likely impacts of actions in wetlands. The executive order requires that short and long-term adverse impacts associated with occupancy, modification or destruction of wetlands be avoided whenever possible. Indirect support of development and new construction in such areas should also be avoided wherever there is a practicable alternative.

To comply with these orders, the NPS has developed a set of agency policies and procedures which can be found in Director’s Order 77-1: Wetland Protection, and Procedural Manual 77-1: Wetland Protection. The policies and procedures related to wetlands emphasize: exploring all practical alternatives to building on, or otherwise affecting, wetlands; reducing impacts to wetlands whenever possible; and providing direct compensation for any unavoidable wetland impact by restoring degraded or destroyed wetlands on other NPS properties.

Visitor Use and Experience

ANILCA Section 101(b) states that Congress intended the Act to preserve “wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing, fishing, and sport

hunting, within large arctic and subarctic wildlands and on free flowing rivers” Recreation and visitor use of the Gold Hill Area is low due to its remote location and access difficulties. Local and sport hunters have an established pattern of use. This area is also included in a hunting concession managed by the NPS. Some residents may also trap there in the winter. The type, degree, and quality of recreation and visitor use could be affected by the proposed mining.

Visual Resources

WRST was established in part to maintain unimpaired the scenic beauty and quality of high mountain peaks, foothills, glacial systems, valleys, streams and coastal landscapes (ANILCA Section 201(9)). Past mining and private land development has impacted many areas within WRST including at least 131 acres within the Gold Hill Study Area (NPS 1990). The proposed mining, as well as other future non-mining related development, would directly impact some components of the natural landscape associated with natural beauty, like vegetation, wildlife, and aquatic resources. Although this action’s direct effects would remain largely confined to previously disturbed areas within the Shamrock Group and along existing trails, such impacts could also indirectly affect visual resources viewed from adjacent preserve lands.

Wildlife

WRST was established in part to protect “habitat for and populations of wildlife including but not limited to caribou, brown/grizzly bears, Dall’s sheep, moose, wolves, trumpeter swans and other waterfowl, and marine mammals (ANILCA Section 201(9)).” Moose, bears, caribou and sheep use or travel through the Gold Hill area (NPS 1990). The proposed mining and access activities, would potentially impact wildlife habitat. This action’s direct effects would remain largely confined to the claim block, but operations could also indirectly affect wildlife using nearby preserve lands. Mining operations can pose potential impacts to wildlife by reducing available habitat and causing temporary avoidance zones.

1.6.2 Issues Dismissed from Further Analysis

Air Resources

WRST is considered a Class II airshed under the Clean Air Act, which requires consideration of impacts on air resources. While construction and mining activities would generate some short term and highly localized machinery emissions and airborne dust, these impacts would be negligible.

Climate Change

Secretarial Order 3226 directs federal agencies to ensure that climate change impacts are considered in connection with departmental planning and decision making. The *2006 NPS Management Policies* direct the operation and management of facilities, vehicles, and equipment in a manner to minimize the consumption of energy, water, and nonrenewable fuels. WRST is projected to become warmer and drier over the next century with winter temperatures becoming significantly warmer (SNAP 2009). Although precipitation is predicted to increase, the amount will likely be insufficient to offset an increase in evapotranspiration caused by warmer temperatures and a longer growing season. A longer growing season will mean shorter periods of frozen ground and changes in the timing of peak melt and river water levels. Seasonal changes will lead to drying of wetlands, streams, and lakes that are not glacially fed. However, it may lead initially to higher water levels in glacially fed waters. It is not anticipated that climate change will have a noticeable impact during the time frame of this mining plan of operations, nor would proposed mining operations have a measureable effect on greenhouse gas emissions and climate forcing.

Environmental Justice

Executive Order (E.O.) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, requires all federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. This action would not result in changes to human health or the environment with disproportionately high and adverse effects on minority or low-income populations or communities.

Park Management

The park has been monitoring and funding minerals management activities at Gold Hill for more than 30 years. The proposed action would require monitoring by park staff to ensure protection of park resources and values, but it would not significantly alter the scope or commitment of park management.

Subsistence

ANILCA Section 810 requires federal agencies to analyze the impacts of federal actions on subsistence resources and lifestyles. Some local rural residents conduct subsistence activities including hunting, trapping and gathering within the general vicinity of this proposed action. This action possesses no potential to result in any additional subsistence restrictions. The ANILCA 810 analysis for this project is attached as Appendix C.

Threatened and Endangered Species

The Endangered Species Act requires an analysis of impacts on all federally listed, threatened, and endangered (T&E) species, as well as species of special concern listed by the State of Alaska. After conducting a survey of the projected sites, WRST resources staff reported finding no listed, threatened, or endangered federal T&E species within the Chisana study Area. Therefore, no Endangered Species Act §7 consultation with the U.S. Fish and Wildlife Service (USFWS) is required.

Wilderness Values

WRST contains approximately 9.1 million acres of designated wilderness and an additional 2.2 million acres deemed suitable for future wilderness designation. However, WRST's 1986 General Management Plan found that the wilderness values of Gold Hill were sufficiently altered by past mining and associated activities to exclude it from future wilderness designation (NPS 1986). The proposed alternative in WRST's 1988 Final Environmental Impact Statement for Wilderness Recommendation also excluded the Gold Hill area from future wilderness designation for the same reason (NPS 1988). The designated Wilderness boundary is located approximately 3.25 air miles southeast of the project area and Shamrock Group is not visible from Designated Wilderness.

1.7 PERMITS AND APPROVALS RELATED TO THIS ACTION

The decision by the National Park Service to approve or not approve a proposed mining plan of operations on the Shamrock Group placer claims is classified as a federal action. Approval to conduct mining would be contingent upon compliance with all applicable State of Alaska and federal statutes and regulations.

A RWCA will be granted to approve access to the Shamrock Group in order to conduct mining operations (See Appendix G).

The claimants will need to post a performance bond before commencing mining operations. Conditions of a performance bond are presented in Appendix B (Engineering and Geological Analysis for Lamal Shamrock Group Mining Plan of Operations).

2.0 ALTERNATIVES

2.1 ALTERNATIVE 1 (NO ACTION) – NO MINING OPERATIONS AUTHORIZED ON SHAMROCK GROUP CLAIMS.

Under this alternative, the NPS Alaska Regional Director would not approve the operator's proposed mining plan of operations. As a result, authorized mining would not occur on the Shamrock and Tony M placer claims at Gold Hill. This alternative provides a baseline for evaluating the changes and impacts of the proposed alternative (See Appendices A and B).

2.2 ALTERNATIVE 2 (PROPOSED ACTION WITH STIPULATIONS) – AUTHORIZE PROPOSED MINING OPERATIONS ON THE SHAMROCK GROUP CLAIMS WITH NATIONAL PARK SERVICE STIPULATIONS

Under this alternative, the NPS Alaska Regional Director would approve the operator's mining plan of operations (MPO) on the Shamrock Group unpatented placer claims. This authorization would include NPS stipulations for resource protection. These stipulations would constitute a mitigation plan designed to minimize and/or prevent potential environmental impacts to park resources and values and would be conditions to the authorization to mine. The proposed mining stipulations are presented in Appendix E.

2.2.1 Access to Shamrock Group using Chicken Creek Airstrip and established trails.

ANILCA 1110 (b) requires the NPS to provide the owners of property within National Park System Units such rights as may be necessary to assure adequate and feasible access to their properties for economic and other purposes. ANILCA 1110(b) also gives the NPS the responsibility to reasonably regulate access to inholdings to protect natural and other values of National Park Service units. A Right-of-Way Certificate of Access (RWCA) will be required to access unpatented placer mining claims at Gold Hill. The Alaska Region of the NPS would utilize the "Interim Guide to Accessing Inholdings in Park Units in Alaska" to develop and authorize an ANILCA 1110(b) RWCA to the claimants.

The claimants (Lamal) described their access to the Shamrock Group in their MPO and subsequently submitted an SF-299 application (February 2013) which incorporates that information. Access to the claims during the mining season would consist of using fixed-wing aircraft to fly to Chicken Creek Airstrip. ATVs pulling a trailer would be used to transport equipment, supplies, materials, fuel and personnel over a distance of 2.4 miles between Chicken Creek Airstrip and the Shamrock Group claims along an established trail. Travel with ATVs would be confined to the existing trail alignment between Chicken Creek Airstrip and Shamrock Group (Figure 5 and Appendix B). The NPS would grant a RWCA for maintenance of Chicken Creek Airstrip and motorized vehicle access between Chicken Creek Airstrip and Shamrock Group (SG) claims along an established ATV trail (Appendix G). The direct and indirect environmental effects related to ANILCA Section 1110(b) access are covered in the 2007 "Established and Maintainable Access to Inholdings Programmatic Plan and Environmental Assessment". NEPA compliance for the Lamal's access to Shamrock Group to conduct mining operations is tiered to the 2007 document.

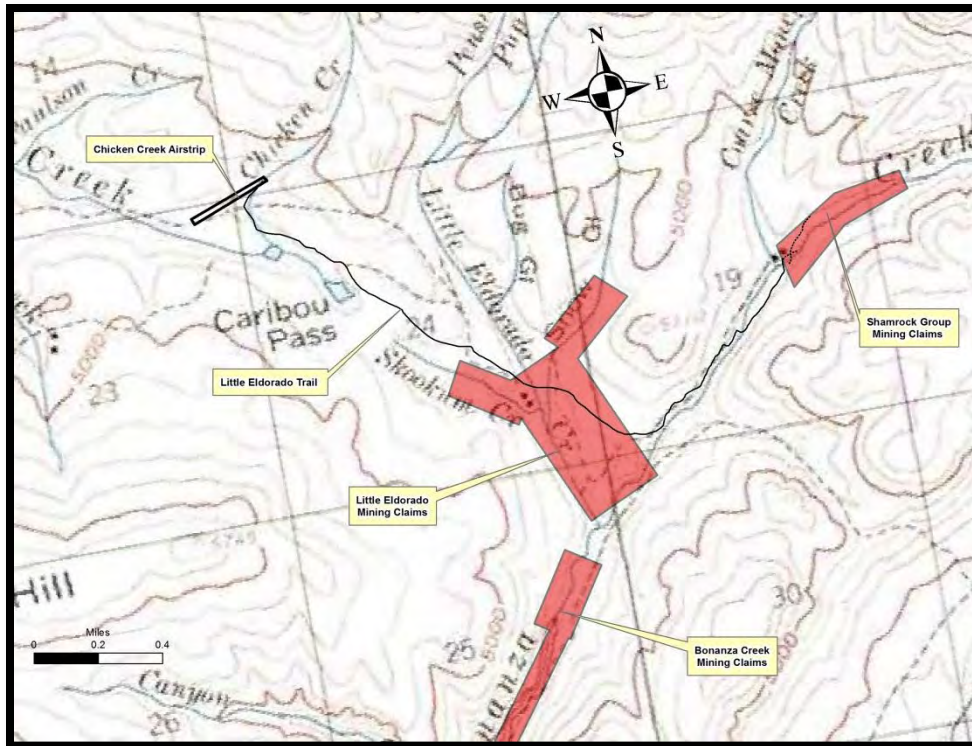


Figure 5: Access from Chicken Creek Airstrip to Shamrock Group

2.2.2 Proposed Mining Plan of Operations –for shamrock group claims

Mine Support Structures and Related Operations:

Mine Support Camp:

The Shamrock Support camp is located within Shamrock Placer Claim along its the western boundary at the confluence of Coarse Money and Bonanza Creeks (Figure 6 and Figure 7). Proposed maintenance and repairs to historic structures as outlined below will be in keeping with the *Secretary of the Interior Standards for the Treatment of Historic Properties* and will be managed with technical assistance and direction by NPS staff. There are a number of existing structures on the claims:

- Meat Cache – no use proposed. Repairs to the roof and the screen are proposed.
- Main Cabin – would house the operators and workers. Repairs and maintenance include installation of vertical supports in the walls and corners. The floor would be repaired with plywood, rough-cut boards and ground-contact treated timbers. The roof would be repaired with rolled metal or a dark metal roofing material. The walls would be recovered with tar paper and wood as necessary and treated with preservative. Windows and doors would be repaired/replaced as needed with rough-cut timbers.
- Small cache behind the main cabin - would not be repaired or used.
- Small storage shed next to the main cabin - would be used to store mining equipment (suction dredge, highbanker, etc.). The roof would be repaired with tin-type or if possible, with a durable metal sheeting.

- Shed - This structure would be used for storage if the roof can be repaired and shored-up.
- Outhouse – would be used in support operations; it would be relocated if necessary.
- Shed - would not be used.



Figure 6: Mine Support Camp on Shamrock, Bonanza Creek in Foreground.

One or two 12ft x 14ft white canvas wall tents and/or three or four 12ft x 16ft “Weather ports” may be utilized. These would be needed if one of the existing structures deteriorates to an unusable condition. In addition, there may be a need for temporary sleeping quarters for visitors or workers. Up to four nylon tents would be set up to provide sleeping quarters. Non-historic tents would be located immediately northwest of the main cabin (Figure 7).

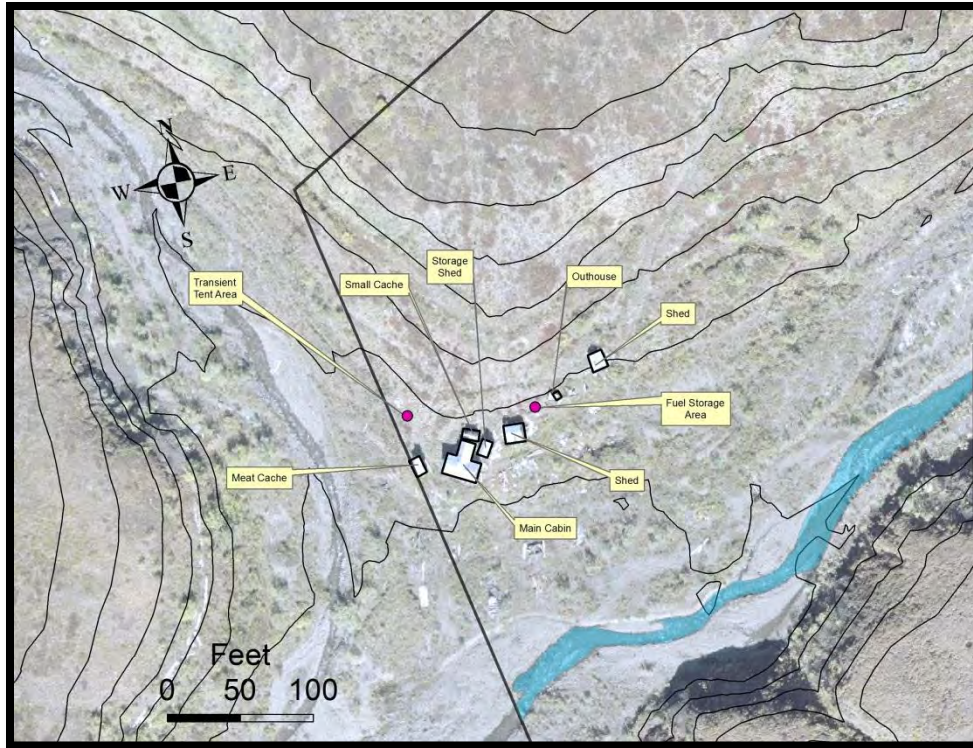


Figure 7: Mine Support Camp – Shamrock

Petroleum Products, Transport Storage and Use:

Fuel would be transported to the Shamrock Group during the winter with snow machine along established cross country access routes. Limited amounts may be transported along the trail between Chicken Airstrip and the claim block during the summer season. Fuel types would include gasoline for the suction dredge, high banker pumps, and ATV; aviation gas, propane for cooking, and potentially diesel for heater.

Fuel would be stored in metal or other bear-proof material containers no larger than 55 gallons. It is anticipated that annual fuel consumption would be less than 100 gallons. Fuels would be stored near the sheds (Figure 7).

Spill containment for fuels consists of an impermeable boundary such as a metal container or commercially available synthetic containment materials. Absorbents pads would be located near the fuel storage area. Fuels spills would be cleaned up.

Human Waste:

An outhouse is located at the support camp. This may be relocated in the future if warranted. Outhouse location/relocation will comply with applicable State regulations.

Solid Waste:

Burnable trash would be burned in a burn barrel at the support camp. Garbage and waste oil would be flown out of the park and disposed of according to State regulations.

Food Storage:

All food would be secured and/or stored in bear resistant containers.

Mining Equipment:

- Suction Dredge - A Keene 4-inch suction dredge is currently on site (Figure 8); it may be upgraded to a 6-inch suction dredge which would have a 5 inch intake nozzle.



Figure 8: Four-Inch Keene Suction Dredge

- Highbanker - A Highbanker comparable to the depicted below (Figure 9).



Figure 9: Highbanker

- Metal Detector - A Fisher Gold Bug 2 metal detector or its equivalent would be used.

Mining Operations:

The proposed placer mining activities would consist of suction dredge mining operations, highbanker mining operations and use of a metal detector for exploration and nugget detection. Proposed mining operations would occur for at least 6 years and would likely continue for the next 10 years or more. The operations would start in early June each year and may continue until September 30 depending upon weather conditions.

Using an average active channel width of 15 feet, the operators propose to dredge up to 15 feet linear feet of channel each day that the dredge is operated. They estimate that the dredge would be operated 30 days per season and that over the life of the plan the entire active channel within the boundary of the claims would be dredged. This may take up to ten years or more. The operator anticipates utilizing the highbanker at 5 to 10 sites each year. Each highbanker mine site footprint would generally be less than 100 square feet with an estimated annual surface impact of less than 500 square feet.

Suction Dredge Mining Operation Component:

Surface Disturbance: Annual 6750 square feet; Ten Years: approximately 0.9 acres

These operations would utilize a 4 or 6 inch dredge. A 6 in dredge has a 6 inch diameter suction hose and the nozzle is necked down to 5 inches, thus reducing the size of rocks entering the suction hose and reducing clogs (Figure 10). The operator would construct a small rock wall 1 to 2 feet high across the active stream channel. This creates a temporary impoundment which allows the dredge to float. The miner would submerge the intake nozzle into the gravel streambed. Water and gravel would be drawn into the intake hose by the suction pump. The material would be pumped into the sluice box to separate the gold from the gravel. The processed gravel and used water would then be discharged into the impoundment/stream from the sluice box. All gravels 5 inches and smaller would be processed through the floating sluice box. Material larger than 5 inches would be moved out of the way by hand and then moved back into the dredge hole. It is anticipated that only one suction dredge would be operated at any one time, but the miner may choose to operate two suction dredges simultaneously at different locations separated by sufficient distance in such a manner to avoid causing any compounding impacts to water quality.

A mining operation with a suction hose six inches or less in diameter, powered by an engine of 18 or fewer horsepower, is considered to be a recreational operation by the State of Alaska (11 AAC 97.100 APPLICABILITY (a)). The claimant has intentionally restricted the size of the suction dredge selected for this MPO to meet those State regulations. The claimant's intent is to not exceed, in aggregate, 30,000 gallons of non-consumptive water use per day through the dredge operations. Dredging is considered to be a non-consumptive use of water by the State of Alaska if daily throughput is less than 30,000 gallons. Any dredging operation with water through-put in excess of 30,000 gallons of water per day from a single source would require a water use authorization permit to appropriate (or certificate of appropriation) from the State of Alaska, Department of Natural Resources, Water Resources Division. If the claimant's dredging operation were to exceed a use of 30,000 gallons per day, the claimant would be required to first secure the water use authorization from the State.

After overburden (barren gravel/alluvium) is dredged, the operator would use hand tools to break open fractured bedrock and use the dredge to extract concentrates from the bedrock. As operations move upstream the dredge would redeposit smaller gravels over the mined bedrock surface. In this fashion,

reclamation is concurrent with the operations. Further reclamation consists of breaking down or leveling any dams that were constructed to a natural/pre-mining contour and grade when the dredge is moved or at the end of the season. Any oversized rocks removed from the dredging area by hand would also be returned to the dredged area.



Figure 10: Suction Dredge Operations Shamrock Group (BLM)

The approximate length of creek bed (within the claims) that would be mined in the Shamrock and Tony M claims is about 2,650 linear feet. With an average active channel width of 15 feet, the operator anticipates 15 feet can be dredged per day and there would be 30 productive suction dredging days in a season. Hence all 2,650 linear feet could potentially be mined within 6 years, but it may take 10 years or more. Dredging operations would be conducted by the Lamal's or their designated operator. They anticipate that mining operations (highbanker and/or metal detecting) on the bench deposits would take place intermittently between dredging days.

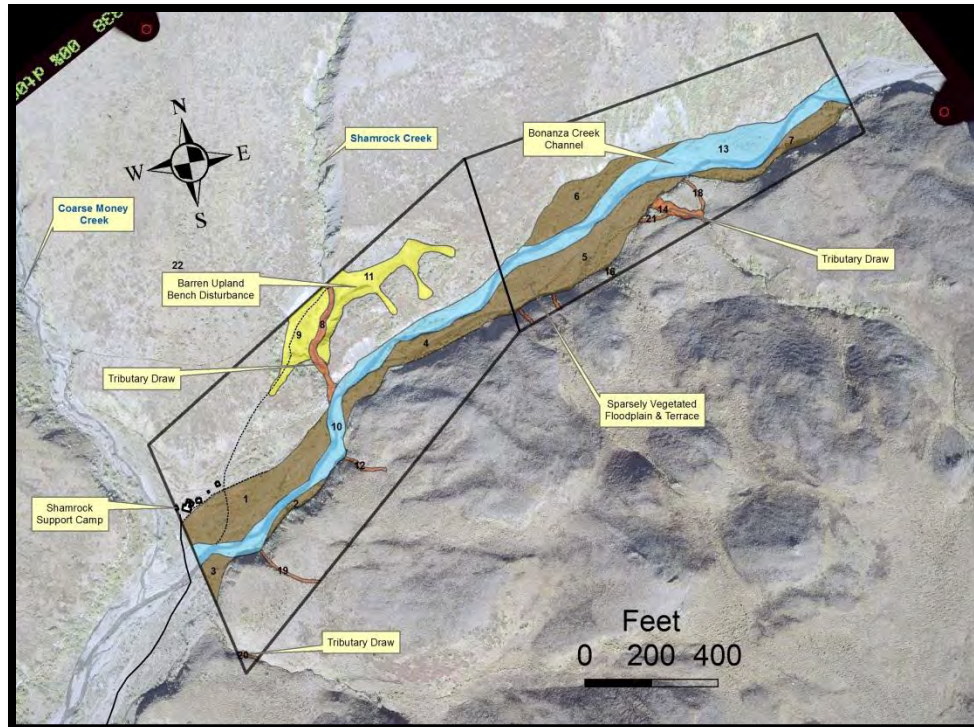


Figure 11: Shamrock Group Potential Mining Areas of Operation

Suction dredge mining operations would occur in areas normally covered by water within the submerged portion of the active stream area. Suction dredge operations would occur in the active Bonanza Creek Stream Channel and those portions of the barren floodplain during periods of inundation caused by high water or channel migration. Suction dredge mining would potentially also be undertaken in the channel portions of the Shamrock Creek Side Channel (Area #8) or the Tony M Side Channel (Area #14) if the subject channel contains sufficient water to operate the dredge; most likely operations would be undertaken with a highbanker or with a 4- inch or smaller dredge (Figure 11).



Figure 12: Operating Suction Dredge Bonanza Creek mining claims (see Figure 1 for location map).

Highbanker Mining Operation Component:

Surface Disturbance: Annual: 500 square feet; Ten Years: 5000 square feet

This component of the mining operation would be confined to areas that were previously mined and/or directly impacted by past mining activities and includes the following Bonanza Creek barren floodplain, Bonanza Creek sparsely vegetated floodplain terraces, side tributary draws and the barren upland bench. Unconsolidated alluvial materials would be excavated by hand and then placed using hand tools (shovel, bucket) into the dump box. A small pump would withdraw water from a nearby source. The highbanker system washes the material across a sluice to separate the gold and concentrates. Washed overburden and tailings are discarded on the ground at the base of the sluice. Reclamation would consist of filling in the holes, leveling the tailings and overburden piles to a condition that approximates the pre-mining topography.

Metal Detector Component:

Surface Disturbance: Annual: 200 square feet; Ten Years: 2000 square feet

The operator proposes to use a metal detector for the purpose of prospecting and sniping nuggets in exposed bedrock areas. Metal detector activities could occur anywhere within the 28.7 acres encompassed by the claims. A hand excavated exploratory hole would typically be less than 1 cubic foot. If the metal object causing the signal is not gold, it would be reburied into the small excavation.

Cultural Resources:

To the extent possible, cultural artifacts would not be disturbed during mining operations. Any isolated artifacts lying on the ground would be temporarily moved to allow mineral extraction; these artifacts would be returned to the location they occupied prior to undertaking mining activities. Direct adverse impacts to cultural resources such as hand-stacked piles and boomer dam remnants would be avoided. The claim owners would continue cooperating with the NPS to remove non-historic debris from the area.

Water Management:**Water use for operations:**

Proposed operations would consist of a six inch suction dredge with an intake diameter of (5) inches which would operate 6 hours or less per day. Smaller-sized dredges may also be used. Water use is projected to be less than 30,000 gallons of water per day. Water pumped through the dredge is returned immediately downstream at the base of the sluice box. The operator has been notified by AKDNR of the determination that a water use authorization would not be required for operations where use would be 30,000 gallons or less per day. However, if water use exceeds 30,000 gallons per day, the claimant/operator would acquire the required permits from AKDNR to be in compliance with state regulations.

The proposed operation includes the use of a highbanker and a pump to feed the highbanker. Volume of water used to support highbanker operations would be dependent upon the size of the pump, but water processed through the highbanker would be less than 30,000 gallons per day.

Water for domestic use would be taken out of Bonanza Creek. Domestic water usage would be less than 50 gallons per day. Water would be hand carried from creek to the cabin.

Waste Water:

Suction dredge discharge water would be returned directly to the stream channel untreated. Water from the highbanker would be discharged onto barren ground and/or floodplain and allowed to flow back into the stream channel or seep into the ground.

Mine Areas:

Areas in which proposed mining operations would occur include; Bonanza Creek stream channel and associated barren floodplain, Bonanza Creek sparsely vegetated floodplain terraces, Shamrock bench disturbance (Figure 13) and numerous small side tributaries in which exploration and/or past mining occurred (Figure 11: Shamrock Group Potential Mining Areas of Operation). The largest tributary is Shamrock Creek; most are small draws and carry little or no water except during wet rainy periods.



Figure 13: Western Boundary Shamrock looking upstream on Bonanza Creek

Within the Shamrock Group there are approximately 3.1 acres of stream channel and associated barren floodplain, 4.8 acres of floodplain with sparse vegetation, 10 tributary draws encompassing approximately 0.4 acres and one upland bench area containing 1.2 acres. The remainder of the area encompassed within the claims would be subject to operations with the metal detector. Other existing disturbances within the claims include water diversion ditches, bladed tracks and the areas surrounding and underlying the historic structures and features (Table 1: Shamrock Group Mining Areas of Operation).



Figure 14: Mined Upland Bench on Shamrock

Table 1: Shamrock Group Mining Areas of Operation (refer to Figure 11)

Category	Number of Polygon Areas	Acreage
Floodplain barren	Two	3.11
Floodplain vegetated	Seven	4.84
Tributary draw	Ten	0.44
Upland barren	Two	1.2
TOTAL		9.59

Access Trails and Routes within the Claims:

An ATV would be operated on the existing bladed trail between the camp and the upland bench workings, along bladed trails on the sparsely vegetated floodplain terraces and over previously disturbed, barren and/or sparsely vegetated ground.

Reclamation

Reclamation is proposed as an ongoing process during all phases of the mining operation. The suction dredge would return processed gravel directly to the stream as it exits the sluice. At the end of the summer field season, the operator would level out any tailings piles. There is no plan to replace top soil in previously disturbed, barren and/or and sparsely vegetated areas that are mined.

Any dams used to enhance water depth for dredge operations would be removed and the dam sites re-contoured to approximate the original grade/topography. Any temporary holes or overburden stockpiles resulting from highbanker mining or excavation associated with use of the metal detector would be back-filled and/or leveled to approximate the original grade/topography.

Final reclamation at the end of approved mining operations shall consist of removing all equipment and supplies transported to the site to support authorized mining activity and removing and disposing of all garbage, refuse and waste transported to the claims in support of authorized mining activity.

2.3 ENVIRONMENTALLY PREFERABLE ALTERNATIVE

As stated in Section 2.7 (D) of the NPS Director's Order 12 Handbook (NPS implementation guidelines for NEPA), "the environmentally preferred alternative is the alternative which would best promote the national environmental policy expressed in NEPA (101((b)). The environmentally preferable alternative is the alternative that not only results in the least damage to the biological and physical environmental, but that also best preserves, and enhances historic, cultural, and natural resources." The No Action alternative is the environmentally preferable alternative because no environmental impacts would occur.

2.4 MITIGATING MEASURES

A complete description of stipulations is provided in Appendix E.

2.5 COMPARISON OF ENVIRONMENTAL EFFECTS

Table 2: A summary of the environmental effects resulting from each alternative.

Impact Topic	Effects from Alternative 1-No Action	Effects from Alternative 2-Proposed Action with Stipulations
Cultural Resources	The combination of direct and indirect and cumulative impacts would result in a minor impact to cultural resources.	Alternative 2 would result in direct and cumulative, long-term positive impacts to cultural resources.
Floodplains	Under the no-action alternative no new impacts to floodplains would occur. Most floodplains and associated resources at Gold Hill including those within the claim block were impacted by mining. Overall these were moderate. NPS management of the cultural landscape and protection of associated historic features in the floodplain would continue have a moderate adverse impact on the floodplain function and values.	Alternative 2 would result in minor direct and indirect negative impacts to local floodplains. Combined with moderate impacts from past, present, and reasonably foreseeable activities, this would result in moderate impacts to floodplains.
Socioeconomic	Under the no-action alternative no mining operations would be authorized adversely affecting the socioeconomic environment. The overall socioeconomic impact would be minor.	The overall socioeconomic impact would result in negligible direct and indirect, minor cumulative beneficial impacts to the local socioeconomic environment. This action's summary impact would be minor because its contribution would be low in terms of the parks total socioeconomic environment.
Soils	Direct and indirect impacts combined with cumulative impacts from past and reasonably foreseeable mining would	Alternative 2 would result in negligible direct and indirect low negative impacts to local soils. Combined with the cumulative impacts

	result in a minor impact to soils.	of past and reasonably foreseeable actions, this would result in a minor impact to area soils.
Vegetation	Direct and indirect impacts to vegetation would be negligible and natural recovery would continue to occur. Combined with the impacts of past, present, and reasonably foreseeable actions, this alternative would result in minor impacts to area vegetation.	Alternative 2 would result in minor direct and indirect impacts to vegetation. Combined with the minor cumulative impacts from past, present, and reasonably foreseeable actions, this would result in a minor impact to area vegetation.
Wetlands	Direct and indirect impacts to wetlands would be negligible and natural recovery would continue to occur. The impacts of historic features on the landscape that were established pre-park will continue to negatively impact the recovery and natural function of area wetlands. No new impacts would occur.	Alternative 2 would result in minor direct and indirect impacts to wetlands, in particular the riverine wetlands (within the stream bed). Combined with minor impacts from past, present, and reasonably foreseeable activities, there would be a minor impact to wetlands that would not degrade the natural and beneficial ecological, social/cultural, or other functions and values of wetlands.
Visitor Use and Experience	This alternative would result in negligible direct and indirect impacts to visitor use. Combined with minor impacts from past, present, and reasonably foreseeable activities, impacts to visitor use would be minor.	Alternative 2 would result in minor direct and indirect impacts to visitor use and experience. Combined with cumulative impacts from past and present mining activities in the area, this would result in minor impacts to visitor use and experience.
Visual Resources	Alternative 1 would result in negligible direct and indirect impacts to visual resources. Combined with cumulative impacts from past and present mining activities, this would result in maintenance of the cultural landscape of a National Register historic district and a positive impact to visual resources.	Alternative 2 would result in minor direct and indirect impacts to visual resources. Combined with cumulative impacts from past and present mining activities, this would result in maintenance of the cultural landscape of a National Register historic district and a positive impact to visual resources.
Water and Aquatic Resources	Under the no-action alternative no new impacts to water resources would occur on parklands resulting from authorization to mine; combined with moderate impacts from past, present and reasonably foreseeable actions, this alternative would have a moderate impact on water resources.	Alternative 2 would result in minor direct and indirect minor negative impacts to local water resources. Combined with moderate impacts from past, present, and reasonably foreseeable activities, alternative 2 would result in a moderate impact to water resources.
Wildlife	Alternative 1 would have negligible direct and indirect impacts on wildlife. Combined with minor impacts from past, present, and reasonably foreseeable future activities, impacts from Alternative 1 would be minor.	Alternative 2 would result in minor direct and indirect impacts to wildlife resources, being of low intensity and temporary to long term duration. Combined with minor impacts resulting from past, present, and reasonably foreseeable actions, Alternative 2 would result in a minor impact to wildlife.

3.0 AFFECTED ENVIRONMENT

The following is a description of the Gold Hill environment in general and Upper Bonanza Creek in particular. For additional details regarding the Gold Hill area, see Final Environmental Impact Statement, Cumulative Impacts of Mining, Wrangell-St. Elias National Park and Preserve, Alaska (NPS, 1990). The Gold Hill Study Area identified in Figure 15 is the project area and is used in this EA for consideration of direct, indirect, and cumulative effects.

GEOGRAPHY AND TOPOGRAPHY

Gold Hill lies in the northeast portion of the WRST approximately 6 miles east of Chisana (Figure 15). Gold Hill (5,815 feet above msl) is situated in the foothills of the Nutzotin Mountains. All waters draining the Gold Hill area flow into the Chisana River. Bonanza Creek is situated along the northeast side of Gold Hill and is part of the Chathenda Creek drainage basin.

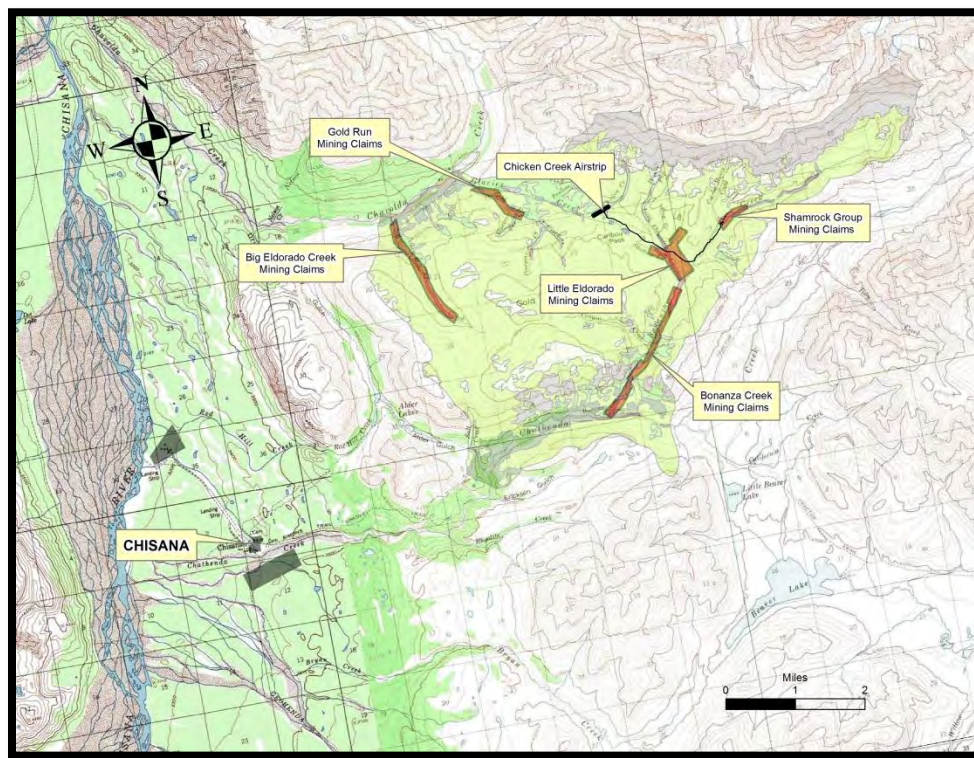


Figure 15: The Gold Hill area showing Chisana in relation to the federal placer mining claims

ORE DEPOSITS AND BEDROCK GEOLOGY

The Gold Hill area is underlain by marine and sub-aerial volcanic and volcanoclastic rocks, argillite, greywacke and conglomerate with small bodies of andesite and diorite. Bedrock exposure within the claim block is limited to argillite and some small volcanic dikes.

Placer gold targeted for mining occurs within the streambed and bench alluvial deposits where the gold is concentrated at the gravel-bedrock contact. The principal gold resource in the district is a byproduct of porphyry copper deposits (Richter, 1975). Auriferous Quaternary-Tertiary gravel capping Gold Hill has also been proposed as a placer source. Gold production between 1913 and 1942 at Gold Hill is estimated

at 45,000 ounces. Though there is no accurate estimate of recent gold production, it is likely that another 10,000 to 20,000 ounces have been produced since 1942 (Ellefson, 2010, unpublished).

3.1 CULTURAL RESOURCES

The Shamrock and Tony M claim areas are within the “Upper Bonanza Creek Historic Mining Area,” as defined in the Cultural Landscape Report (Feldman 2000). These two claims approximate the historic Bonanza 10 and Bonanza 11 claims, respectively. The claims contain numerous historic buildings, structures, sites and objects (Table 3); and represent continuous mining throughout the historic period of significance (1913-1945).

The claims were mined extensively after the initial Chisana Gold Rush, continuing through the 1920s and 1930s, primarily through shoveling and sluicing, although hydraulic mining was also used in the 1930s. The “Coarse Money Confluence Habitation Cluster” (Feldman 2000:113; recorded as AHRS # 49NAB-00046) and the “Upper Bonanza Habitation and Drift Mining Cluster (ibid; recorded as AHRS # 49NAB-00102) thus likely represent the only areas within the stream beds that have not been significantly altered by mining activities. Recovery of vegetation, habitat and stream substrate has been minimal, and the whole reflects a landscape in which the cultural remains are an integral component.

Subsequent mining (Beyond the 1950s) has not significantly altered the historic landscape, and the claims and the resources they contain retain a high degree of historic integrity.

The cultural resources within the Shamrock and Tony M claims have been extensively documented and mapped, through the Cultural Landscape process (Feldman 2000). Although not individually significant, these structures, sites, and objects are contributing elements to the Chisana-Gold Hill Historic District, which is listed on the National Register of Historic Places.

Table 3 lists the cultural resources within the boundaries of the two claims. The buildings are listed with the Alaska Heritage Resources Survey (AHRS) under the parent site number 49NAB-00046; many have been split out and assigned their own individual numbers, and all have also been entered into the NPS’ List of Classified Structures. All of these buildings were evaluated to be in Fair to Poor condition by NPS Cultural Resources staff in 2012. Collectively, NAB-046 is referred to as the Coarse Money Confluence Habitation Cluster (Feldman 2000:103).

The history of the Chisana gold rush and the development of the Shamrock and Tony M claims have been extensively documented in the CLR (Feldman 2000). Both claims (as the historic Bonanza 10 and 11 claims) were mined as early as 1914, and hand sluicing and hydraulic mining was active through the 1930s. The main cabin (LCS # 38073) is the only T-shaped cabin in the historic district. Originally located down Bonanza Creek at the confluence with Little Eldorado Creek where it served as a post office, it was moved to its current location in 1915. The other buildings were reportedly constructed in the 1930s (Feldman 2000: Appendix I, Table 3).

In order to preserve the historical character of the mining landscape, the CLR treatment recommendations for these claims include “maintain mining as the primary use...” such that “continued mining on the active claims does not disturb the spatial patterns of the historic landscape” (Feldman 2000:142).

Table 3: Cultural Resources within the boundaries of the two claims

AHRS # (CLR #, if different)	Name	LCS ID #	LCS Mgmt. Category or comments
NAB-046a	Doghouse (Fea. 6)	38077	May be preserved
NAB-046b	Outhouse (Fea. 7)	38078	May be preserved
NAB-046c	Shed (Fea. 8)	38079	May be preserved
NAB-156	Cache(Fea. 1)	38072	May be preserved
NAB-157	Cabin (Fea. 2)	38073	May be preserved
NAB-158	Cache (Fea. 3)	38074	May be preserved
NAB-159	Shed (Fea. 4)	38075	May be preserved
NAB-160	Shed (Fea. 5)	38076	May be preserved
NAB-102	Historic Artifact Scatter and pits		
Iso 219	Sled Remnant		
Iso 226	Trash Scatter		
Iso 238	Dam Remnant		Part of NAB-064?
Iso 223	Ditch		Part of NAB-064?
Iso 228	Dam Remnant		Part of NAB-064?
Iso 224	Hand Stacks and windrows		
Iso 229	Hand stacks		
Iso 227	Campsite		
Iso 225 (217)	Mined bench		
Iso 246 (241)	Ditch		
Iso 218	Lumber scatter		
Iso 220	Hydraulic Mined area		
Iso 225	Mined bench		

3.2 FLOODPLAINS

Most historic mining operations were situated within the floodplains and adjacent riparian zone in the Gold Hill area (Figure 16). These floodplains and riparian zones have been extensively disturbed, are dysfunctional, and have lost significant components; they no longer resemble un-mined reaches elsewhere in the area. Past mining disturbance has altered most of the streambed, floodplain and associated wetlands along the drainage bottoms. The streambed was significantly disturbed between the downstream boundary of Shamrock and the upstream boundary of Tony M claims (Figure 16). Remnants of historic boomer dams, hand-stacked tailings, and prospect pits are situated in the floodplain and may adversely affect floodplain function.

The Shamrock Group contains approximately 8.3 acres of lands subject to flooding including: 3.1 acres of barren floodplain with channel, 4.8 acres of vegetated floodplain with associated terraces and 0.4 acres of tributary channel. The proposed operations area could potentially affect all 8.3 acres. The drainage area which may be subject to flooding ranges from 75 to 250 feet wide on the claim block. The floodplain is widest downstream from the confluence of Coarse Money Creek.

During times of high water, significant portions of the floodplain may be covered including the barren streambed, inactive channels, floodplain and portions of the adjacent vegetated gravel bars and banks. Periodic flooding increases bed load and causes channel migration. These flood events scour the stream bottom and riparian area, slow the establishment of aquatic and terrestrial vegetation, and often permanently alter the physical characteristics of the stream channel and associated floodplain.

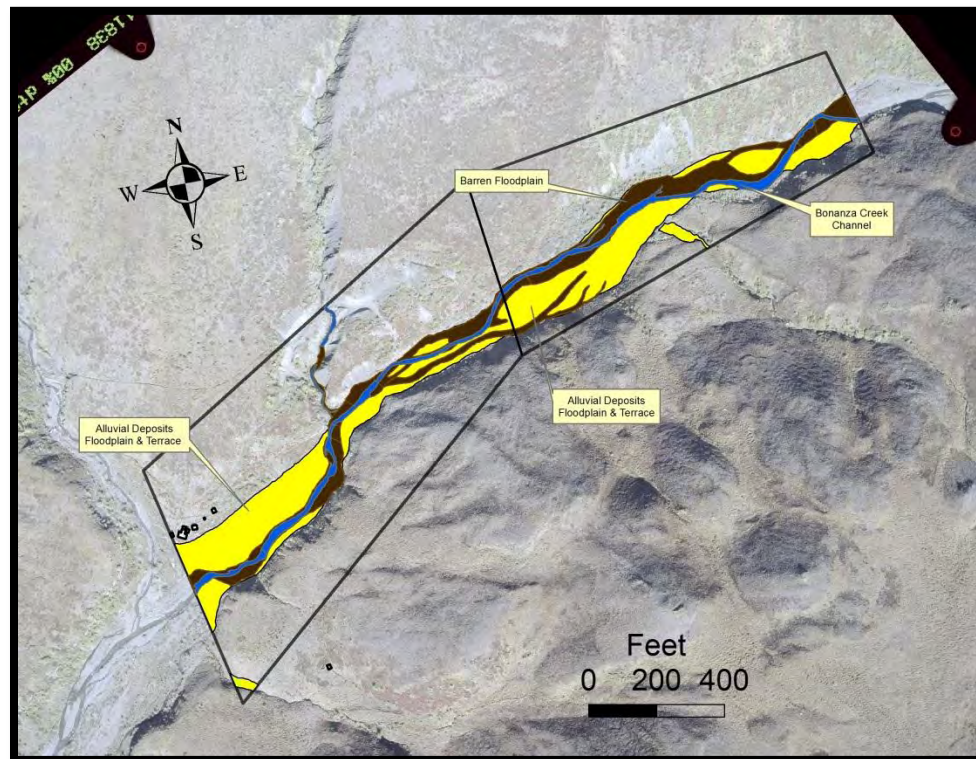


Figure 16: Floodplain and associated alluvial deposits

3.3 SOCIOECONOMICS

The local economy of the Chisana area has been dependent primarily upon big game guiding and, to a lesser extent, gold mining and tourism. Income from tourism in the area is mainly restricted to air taxis operations, lodges and guides in support of summer and fall activities. Since 1983 there have been minor periodic contributions to the Chisana economy from NPS field operations. These expenditures are principally for lodging for fire management, resource protection and minerals management field crews.

Placer mining, mostly suction dredge and highbanker operations, have been conducted on Big Eldorado and Bonanza Creek fairly continuously since the 1970s and on the Shamrock Group from 1970 to the late 1980's. The Big Eldorado claimants have not undertaken any heavy equipment placer mining operations on their claims since the NPS authorized mining there in 2000. None of the currently authorized mine operators are local residents; income from the operations generally does not directly benefit the local economy of Chisana. Expenditures by the miners are made with local air taxis and the highway communities outside the park/preserve.

3.4 SOILS

SOILS AND SURFICIAL GEOLOGY

Regional climatic conditions control the character of upland soils in the area. Low soil temperatures and discontinuous permafrost limit soil development. Soils typically consist of a thin (5 to 7 cm) surface organic layer covering loamy to sandy loam, which cap bedrock and glacio-fluvial deposits with a Holocene volcanic tephra. The depth of the seasonally active soil layer ranges from 30 to 60 cm. Soil moisture regimes range from mesic to hydric. Soil oxygen content is low in the hydric soils.

Surficial deposits along the access trail between Chicken Creek and Bonanza Creek include: (1) solifluction and creep surfaces which may include glacial drift deposits, (2) undifferentiated glacial deposits of gravel and sand over weathered bedrock, and (3) alluvial fans and floodplains consisting of gravel and sand (Richter, 1973). Channel and bank gravel bars are present throughout much of Bonanza Creek floodplain (Figure 14). Most stream channel and bank gravel bars on the claims were severely altered as a result of historic mining. Mining exposed mineral and organic soil, subjecting it to erosion and downstream transport; leaving a gravel and cobble substrate. Minor amounts of fine-textured material are deposited throughout the floodplain.

3.5 VEGETATION

Landcover and Dominant Species

Comparing the landcover data from 1990 (Happe 1990) to 2008 (Jorgenson et al. 2008) it is evident that there has been some recovery of previously disturbed areas resulting in a decrease of barren cover and an increase of shrubs particularly along the draws (Figure 17, Figure 18). In the Shamrock Group the park mapped 4.8 acres of previously disturbed mine lands. The acreages estimated for the 1990 EIS as previously disturbed mine lands were a gross under estimate. We have subsequently revised the estimate to 19.7 acres, or 69% of the Shamrock Group. Change detection shows that much of that original 131 acres of disturbed land is in some stage of vegetation recovery.

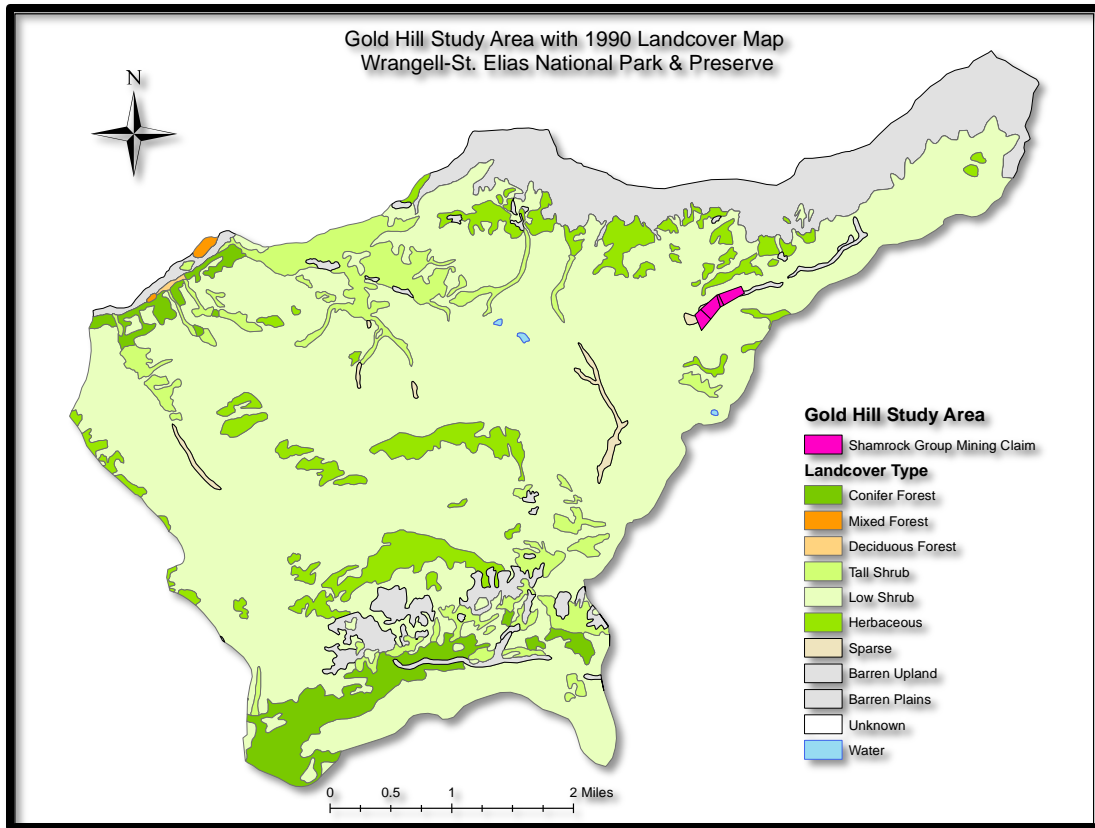


Figure 17: Gold Hill Study Area with 1990 Landcover Map.

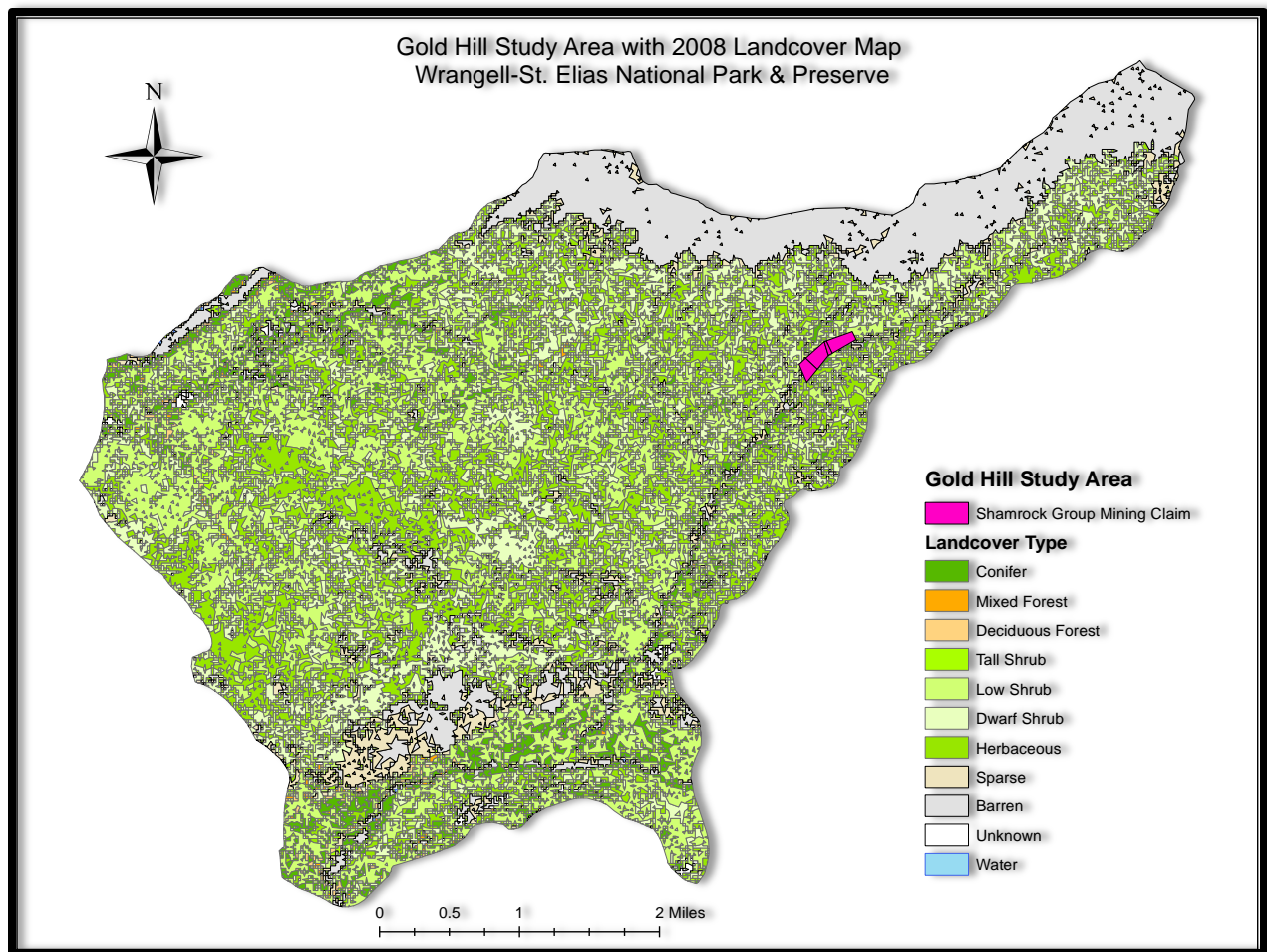


Figure 18: Gold Hill Study Area with 2008 Landcover Map.

Mullen (1992) described the vegetation in the vicinity of the mining claims. The majority of the Shamrock Group is covered by low shrub (Table 4). Kinnikinnik (*Arctostaphylos uva-ursi*), dwarf birch (*Betula nana*), Labrador tea (*Ledum palustre*), Lapland rosebay (*Rhododendron lapponicum*) and shrubby cinquefoil (*Potentilla fruticosa*) are dominant. Blueberry (*Vaccinium* sp.), dwarf willow (*Salix spp.*), bog cranberry (*Oxycoccus microcarpus*) and Labrador tea are common. The other two dominant landcover types are herbaceous, primarily consisting of a variety of low forbs, and sparse, which consists of pioneer vegetation with little or no close ground cover. The latter occur primarily in the floodplain where channel and bank gravel bars are often flooded and scoured areas lack well-developed soil horizons or an organic layer.

Table 4: Comparative vegetation classes in the Gold Hill Study Area and Shamrock Group Mining Claim.

Vegetation Class	1990 Landcover Data					2008 Landcover Data				
	Acres in Gold Hill Study Area	% of Gold Hill Study Area	Acres in Shamrock Group Claim	% of Shamrock Group Claim	1986 Mining Disturbance Acres in Gold Hill Study Area ¹	Acres in Gold Hill Study Area	% of Gold Hill Study Area	ACRES in Shamrock Group Claim	% of Shamrock Group Claim	1986 Mining Disturbance Acres in Shamrock Group ²
Coniferous forest	549.0	4.0%			5	645.4	4.7%	2.5	8.7%	0.2
Deciduous forest	5.9	0.0%				86.7	0.6%	0.2		
Mixed forest	14.0	0.1%				38.1	0.3%			
Tall shrub	872.9	6.3%			3	142.1	1.0%	1.0	3.6%	0.5
Low shrub	9,596.7	69.3%	18.6	65.0%	120	4,256.3	30.8%	11.2	39.2%	9.6
Dwarf shrub		0.0%				2,810.0	20.3%	1.7	5.9%	1.2
Herbaceous	886.6	6.4%				3,169.4	22.9%	5.0	17.3%	2.7
Sparse	69.7	0.5%	4.8	16.7%		725.6	5.2%	5.2	18.1%	3.9
Barren	1,838.4	13.3%	5.2	18.3%	2	1,904.4	13.8%	1.9	6.5%	1.5
Water/ Glacier	5.7	0.0%				1.5	0.0%			
Unknown	0.4	0.0%				59.8	0.4%			
TOTAL	13,839.4		28.6		131	13,839.4		28.6		19.7

¹ It is believed that this disturbance was highly underestimated.

² In the 1990 EIS this was estimated at 4.8acres which was an underestimate.

Species of Concern

There are no USFWS Threatened and Endangered plant species or USFWS Species of Concern documented within the Gold Hill Study Area. Four Alaska Natural Heritage Program (AKNHP 2013) rare plants have been documented within the study area (Appendix F: Plant Species List):

- Moonwort (*Botrychium ascendens*) G3 S2S3 and BLM sensitive species (G3 = Either very rare and local throughout its range or found locally in a restricted range, 21 to 100 occurrences, threatened throughout its range, S2S3 = Between S2 = Imperiled in the state, 6 - 20 occurrences and Rare or uncommon in the state, 21 - 100 occurrences.)
- Lancepod Whitlowgrass (*Draba praealta*) G5 S1Q (G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, S1Q = Critically imperiled in the state, 5 or fewer occurrences with some uncertainty about taxonomic status that might affect global rank.)
- Bostock's Minerslettuce (*Montia bostockii*) G3 S3 (G3 = Either very rare and local throughout its range or found locally in a restricted range, 21 to 100 occurrences, threatened throughout its range. S3 = Rare or uncommon in the state, 21 - 100 occurrences.
- Bluegrass (*Poa secunda*) G5TNR S1S2 (G5TNR = Global rank not yet fully assessed but believed that this subspecies or variety is secure, common, widespread, and abundant. S1S2 = between S1 = Critically imperiled in the state, 5 or fewer occurrences and S2 = Imperiled in the state, 6 - 20 occurrences.)

Botrychium ascendens was listed as a candidate USFWS candidate species but was dismissed in 1993 when it investigation revealed it to be more abundant then believed (ITIS 2013). Studies in WRST have shown it to be more resilient to disturbance then initially thought (Stensvold & Farrar 2008). *Montia bostockii* was listed as a candidate USFWS candidate species in 1985 but was dismissed in 1990 when it was found to be much more common and widespread than previously thought (ITIS 2013). We do not anticipate that populations will be affected although a rare plant survey has not been conducted specifically of the Shamrock Group based on the habits of the species of concern and their localized abundance at Gold Hill.

Noxious Species

To date, no non-native invasive plants have been documented in the Gold Hill Study area although no specific investigation has been made (NPS 2012, Lain and Terwilliger 2003). However, as the area has been intensively, if sporadically surveyed during the course of inventories and compliance work, it is assumed that no populations have as yet established themselves in the area. Due to the disturbed nature of the ground, the Shamrock Group could be very susceptible to an establishment of an invasive population were seeds to be introduced.

3.6 WETLANDS

Past mining disturbance has resulted in the loss of wetland function, soils and vegetation cover and it has altered and de-vegetated the floodplain and some adjacent upland along the stream corridor. At present, the riverine system wetlands consists of the perennial stream channel and intermittently flooded channel and terrace gravel bars. Floodplain gravel bars and terraces contain early successional vegetation in various stages of development.

Wetlands were identified from wetland delineation conducted by the NPS in July of 1999 in conjunction with the Big Eldorado MPO EA (1990, Figure 19). In 1990 the following acres of vegetation types were mapped: Riparian (aka riverine) = 4.12, Floodplain = 0.05acres, Cutbank = 5.3acres, Bench = 1.44acres, Gramminoid/Herbacous = 0.6acres, Dwarf Shrub = 3.3acres, Open Low Shrub = 0.6acres, Closed Low

Shrub = 7.3acres, Open Tall Shrub = 5.2acres, Upland = 0.8acres where Cutbank & Bench are naturally disturbed areas.

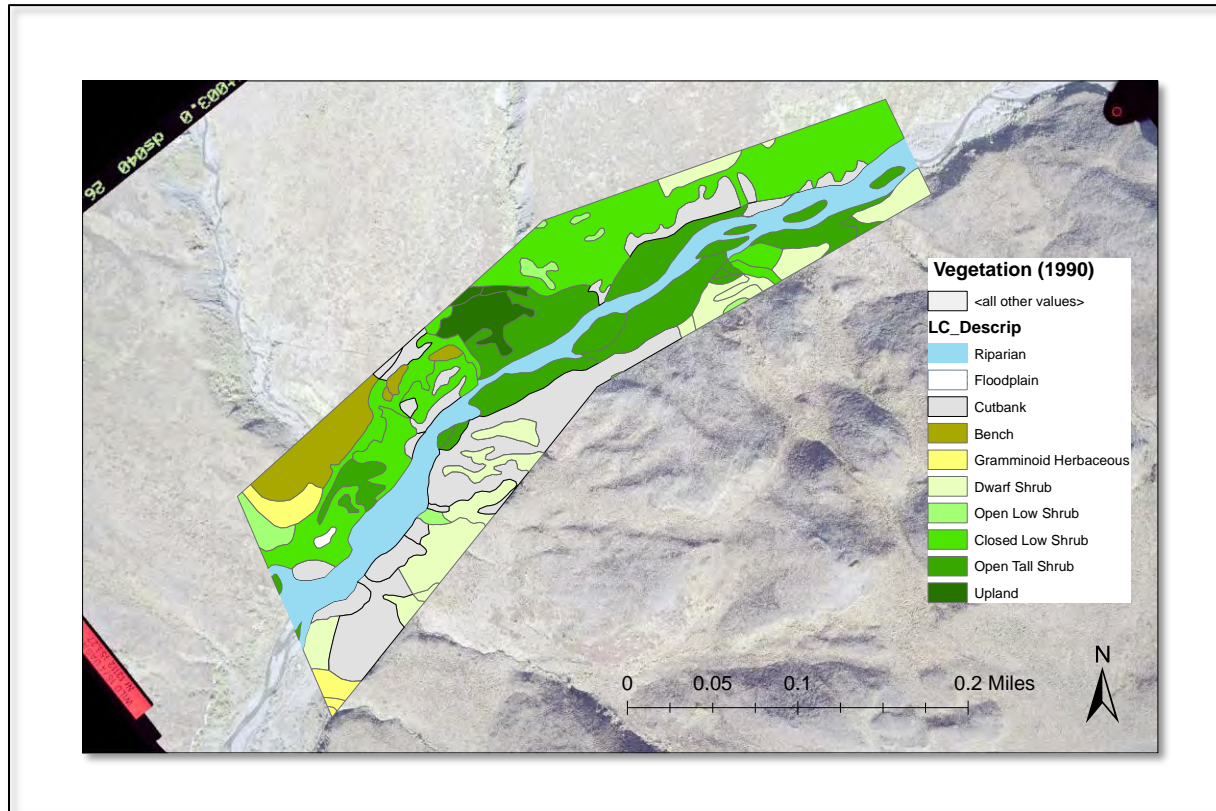


Figure 19. 1990 Mapped vegetation on the Shamrock Group Claim.

Based on Cowardin et al (1979) and the 1990 vegetation mapping data it has been determined that three types of wetlands are found within the proposed area (Figure 20): 4.12acres of unconsolidated, upper perennial, riverine wetlands in the streambed, 0.05acres of intermittent, unconsolidated shore, riverine wetlands on the floodplain, and 5.3acres of scrub-shrub, palustrine wetland on the cutbanks around the active stream channel. In total there is 9.47acres of wetlands within the Shamrock Group claim.

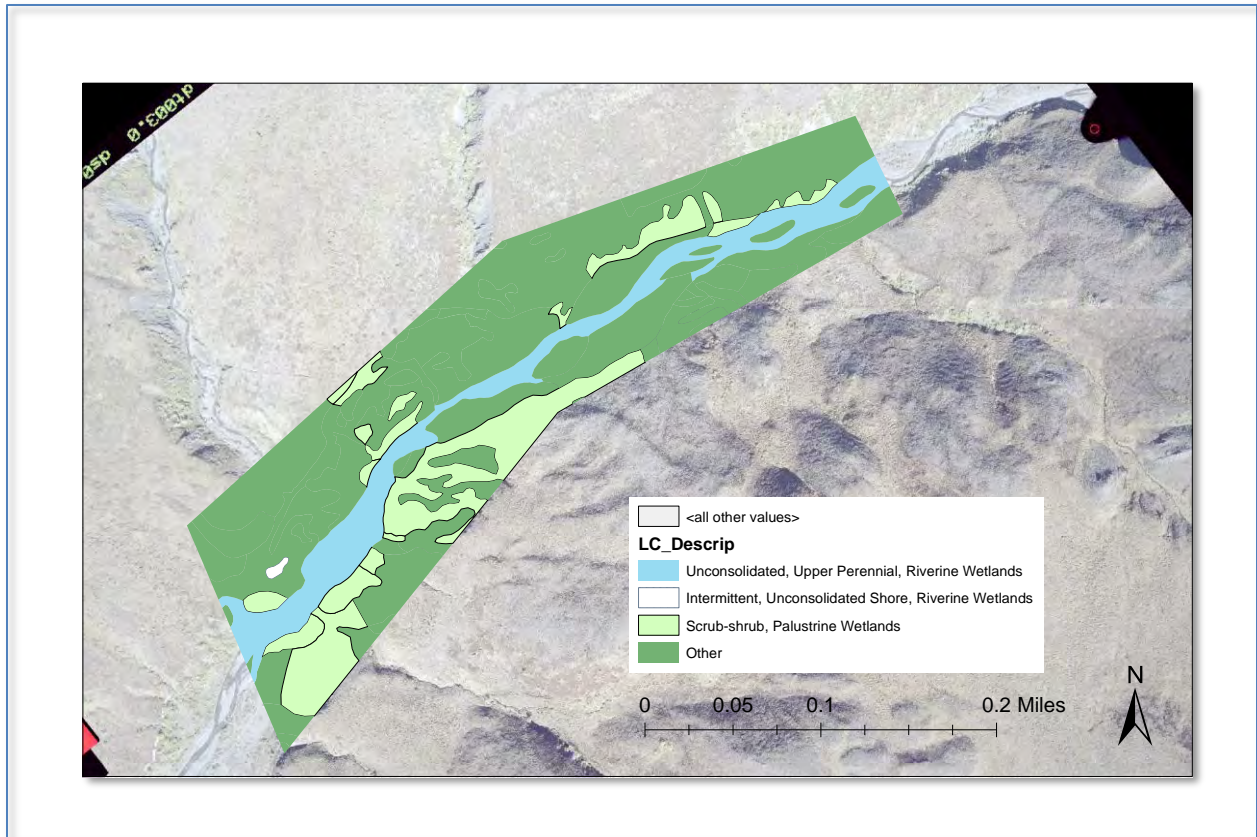


Figure 20. Wetlands within the Shamrock Group mining claim based on Cowardin et al. (1979)

3.7 VISITOR USE

The proximity to Chisana and Chicken Creek airstrips, rolling hills, wildlife, surrounding mountains, and historic structures and artifacts give the Gold Hill area a high potential for future recreational use. The area provides opportunities for quality backcountry experiences due to its remoteness, natural and cultural landscape, and viewsheds.

The Gold Hill area and surrounding country has a trail system and established airstrip. The uplands are relatively dry and allow for easy hiking. Recreational use of the area is currently very low due to the expense of access. The primary recreational activity in the area is sport hunting, primarily for Dall sheep. At least one outfitter/guide utilizes the Chicken Creek airstrip as a staging area for sport hunting. There are an increasing number of visitors that travel to Chisana and Gold Hill to explore the historic district and attempt recreational gold panning. Summer access is by foot over the historic trails and by aircraft. Winter recreational snow machine use is minor but likely to increase because of the improved capability of modern machines.

The park maintains two public use cabins in the area; one adjacent to the Chisana airstrip and another on Gold Run Creek on the northern flank of Gold Hill. At least one local air taxi advertises drop-off/pick-up backpack trips that originate or end at Chisana.

3.8 VISUAL RESOURCES

The Chisana study area is characterized by rolling hills covered with moist tundra. From the top of rounded Gold Hill, several shallow valleys flow north and east. Bonanza Creek forms a steep-sided, narrow and rocky canyon in its lower reaches, while Chavolda and Chathenda creeks, both wide, braided streams, have formed major, spruce-lined valleys on the north and south ends of the study area. A long barren ridge of talus forms the northeast edge of the study area.

Views from the study area are oftend down the broad shallow drainages, across the unseen valleys of Chavolda or Chathenda creeks, and are then limited by small, nearby, rocky mountains. From some of the higher sites in the study area, the very wide and braided channel of the Chisana River and the Nutzotin Mountains can be seen.

Past mining activity on Bonanza Creek has altered the natural appearance of the area. Disturbance of the streambeds and along ORV access routes, and the construction of cabins, flumes, dams and other structures lessens the seeming isolation of the area. However, the old workings are of historic significance and scientific interest and therefore hold value to many park visitors.

3.9 WATER AND AQUATIC RESOURCES

Water resources

Bonanza Creek watershed is an unforested alpine drainage encompassing slightly less than 3 square miles above the Shamrock Group. It originates in the Nutzotin Mountains at the 8,010-foot elevation and flows approximately 6 miles before joining Chathenda Creek. Thirty-four discharge measurements have been recorded on Bonanza Creek between its confluence with Chathenda Creek up to an elevation of 5,000 feet, approximately 1 mile above the subject claims (Table 5). During periods of high water, stream flow reaches flood stage and significant portions of the floodplain are inundated. Measured or estimated discharge above the Bonanza No. 6 ranges from less than 4.7 cubic feet per second (cfs) to over 45.2 cfs (Appendix I, Table I-2). Discharge at its confluence with Chathenda Creek ranges from less than 10.4 cfs to 69.6 cfs. Flow in the Bonanza Creek varies substantially between periods with heavy rainfall and dry summer intervals. Surface flow within the claim block can drop below 1cfs. During the winter months all surface water typically freezes and aufeis develops.

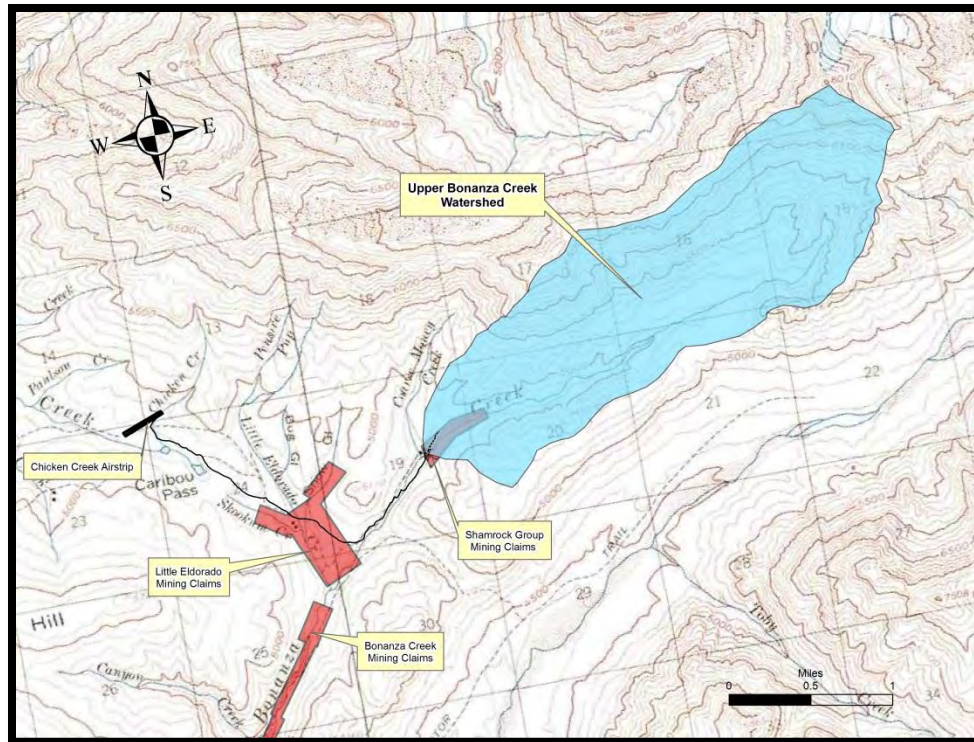


Figure 21: Upper Bonanza Creek Watershed

There are approximately 2,650 linear feet of wetted stream channel within the claims. During normal flow conditions, one or two channels are active. The channel is braided and very dynamic; it is generally 8 to 14 feet wide with sections up to 20 feet wide. Channel elevations within the claim block range from 4,742 to 4,814 feet with an average gradient of approximately 3 percent.

Results of the USGS Environmental Geochemical study of Gold Hill waters show: (1) surface waters at Gold Hill are calcium-bicarbonate dominate, with minor contributions of sulfate magnesium, sodium and potassium; (2) values for pH range from 7.3 to 8.5; (3) conductivities range from 52 to 416 $\mu\text{S}/\text{cm}$; (4) alkalinities range from 16 to 150 ppm; (5) none of the significant parameters for drinking water pH (Ag, Al, As, Ba, Be, Cd, Cl, Cr, Cu, F, Fe, Hg, Mn, Na, Ni, NO_3 , Pb, Se, SO_4 , Tl or Zn) were found to exceed Alaska Department of Environmental Conservation Maximum Contaminant Level (MCL) values (Eppinger and others, 2000).

Table 5: Bonanza Creek Water Data at 5000(ft) elevation

DATE	TEMP	TURB	COND	PH	DO	ALKA	HARD	WIDTH	DEPTH	VEL	DSCHG
6/24/87	5.0	1.60	240	8.00	11.76	183.0	165.0	6.00	0.251	1.670	2.520
7/10/89	9.0	0.25	355	8.00	10.00	168.5	270.0	8.53	0.240	0.623	2.376
7/11/90	5.7	0.70	420	8.07	6.00	168.0	277.0	2.79	0.722	0.266	0.221
7/25/91	4.5	3.80	520	8.42	11.00	201.0	340.0	5.50	0.160	0.294	0.355

Aquatic Resources Reference

The water quality of Bonanza Creek is within the acceptable range required to support aquatic life, according to USEPA and DEC standards. However, aquatic life and biomass of the creek is not abundant. Alterations to physical characteristics of the stream and the removal of riparian vegetation by past mining probably have impacted the aquatic habitat. Samples of macro invertebrates collected from lower Bonanza Creek in the Gold Hill district indicated that very few species of macro invertebrates are present in the placer mined creeks and these populations are sparse. Similar conditions are likely in the previously mined areas of upper Bonanza Creek. Non-disturbed areas of the creek bed do develop sparse algal mats in late summer which are not present in area being actively disturbed. However, this algae seems to come back the next summer if disturbance ceases and always exists in some quantities in the stream.

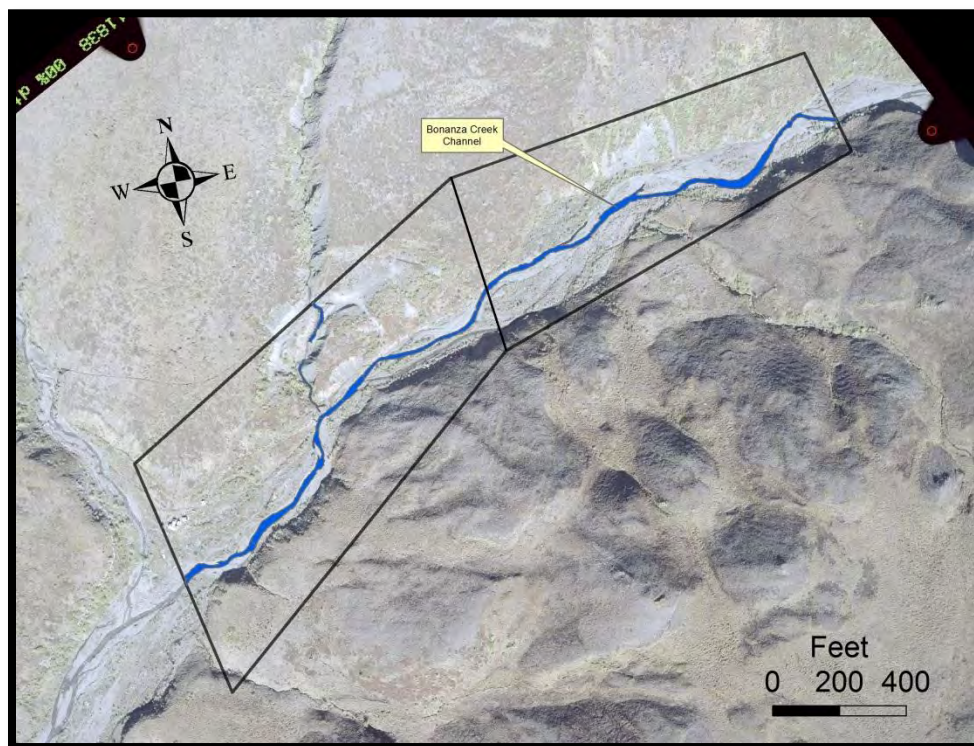


Figure 22: Stream Channel Shamrock Group

The closest known fish to Bonanza Creek are Arctic grayling (*Thymallus arcticus*) in the Beaver Creek drainage approximately 3 miles southeast of the mouth of Bonanza Creek. Beaver Creek and Bonanza Creek are separate drainages with no likelihood of fish passage between them. The Alaska Department of Fish and Game (ADF&G) has no documentation of fish presence in Bonanza. Bonanza Creek appears to have contained suitable habitat for fish prior to historic mining (NPS 1991:81)

4.10 WILDLIFE

WRST was established in part to protect habitat for and populations of wildlife, including but not limited to caribou, brown/grizzly bear, Dall's sheep, moose, wolves, trumpeter swans and other waterfowl, and marine mammals. Therefore, the main wildlife species of interest addressed in this Environmental Assessment include caribou, brown/grizzly bear, Dall's sheep, and moose, and the primary effect on these species is the loss of vegetation or habitat. Secondary effects are the presence of human activity and noise created by the operation.

The Gold Hill study area is part of the range utilized by the Chisana caribou (*Rangifer tarandus*) herd (Figure 23). The Chisana caribou herd is a small international herd that ranges across the Alaska-Yukon border. During the 1990s through 2003, the herd experienced a long and steady population decline. As a result, all harvest of Chisana caribou was stopped in 1994. From 2003 to 2006, a recovery effort designed to increase recruitment and calf survival was conducted by enclosing pregnant cows in a predator free holding pen during the final weeks of gestation and several weeks after calving. The herd is currently managed under an international, multi-agency 5 year (2010-2015) management plan. The 2010 population estimate for the herd was 682 caribou with an adult sex ratio of 42 bulls per 100 cows, and a recruitment ratio of 23 calves per 100 cows. Based on stable population estimates, a small subsistence harvest from the herd was allowed in 2012. The Gold Hill area provides year-round habitat. Peak calving occurs between May 20 and 25 and has been reported on the gentle slopes on and around Gold Hill. Caribou habitat in the Gold Hill study area includes tall and low shrub and alpine tundra types. Caribou forage on the lichen rich vegetation mats and low shrubs (Mullen, 1992).

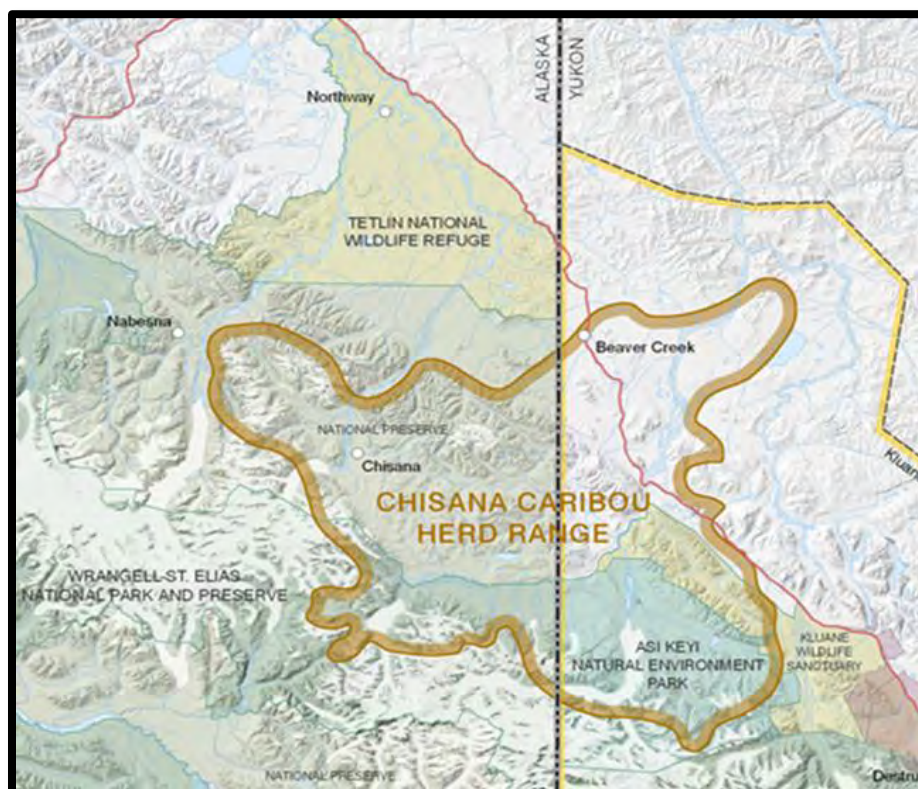


Figure 23: Annual range of the Chisana caribou herd and overlapping political boundaries in Alaska and Yukon Territory. Herd range is based on radio collar locations from 1988-2008

Dall's sheep (*Ovis dalli*) are most prevalent in the high mountains and steep rocky slopes in the Gold Hill area. The area is within sheep survey unit 7 west (SU 7W), bounded by the Chisana River to the west and north, Snag and Carl Creeks to the east, and Beaver and Bryan Creeks to the south. Aerial sheep surveys were conducted in SU 7W during August 1998, July 2005 and June 2011 (Figure 24). The 2005 and 2011 surveys indicate a population of 400 to 450 sheep within SU 7W, with an average 248 ewes, 61 lambs, and 115 rams. During surveys, sheep were observed in the upper Cathenda Creek drainage between 4000 and 6000 feet. During the 2011 survey, a group of 28 ewes and 6 lambs was observed on the ridge between Cathenda Creek and Bonanza Creek. Twenty sheep were counted on Gold Hill during the 1998

survey. Lambing occurs between mid-May and early June. Graminoids, forbs, and shrubs comprise a large portion of the Dall's sheep diet. In spring, Dall's sheep move to lower elevations to feed on newly emergent vegetation, especially willows. As the snowline retreats, sheep move upslope to feed, and by early fall, sheep may move back down to alpine or subalpine valley floors and lower slopes, feeding on willows and carbohydrate rich lichens. Dall sheep habitat in the Gold Hill area includes some upland barren, tall and low shrub, and alpine tundra.

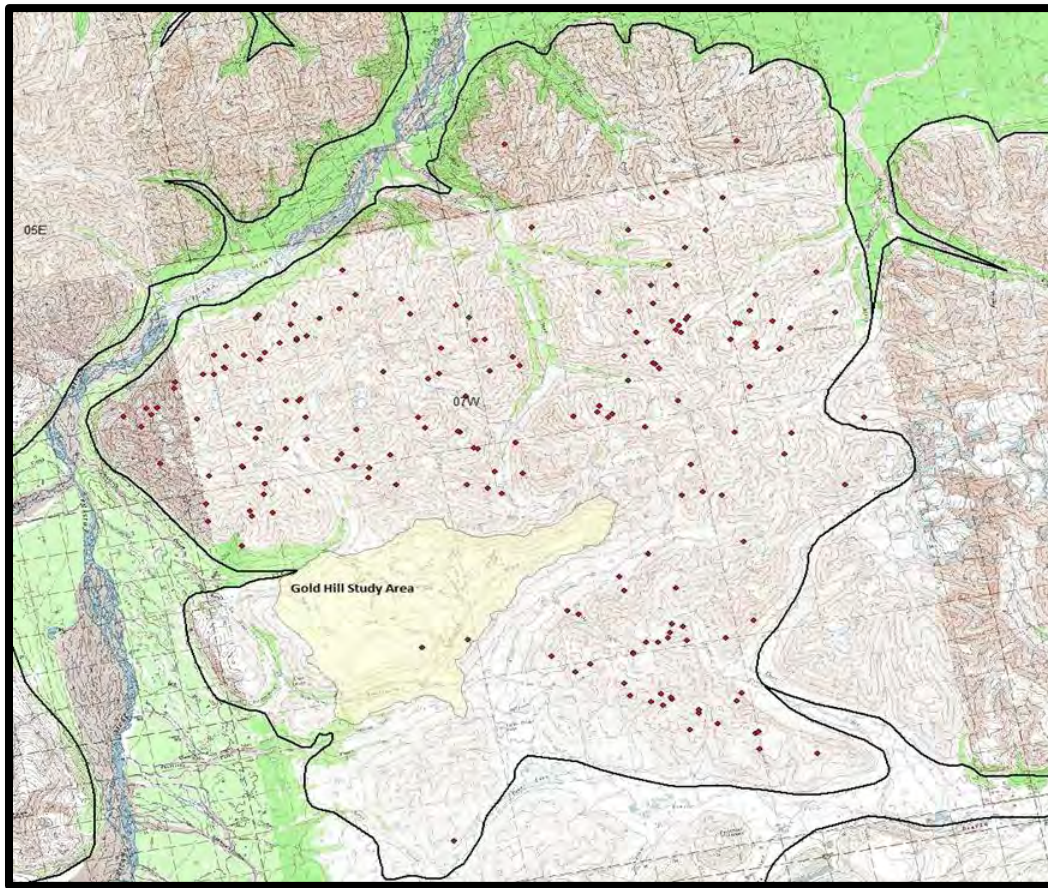


Figure 24: Dall's sheep locations during aerial sheep surveys, August 4, 1998, July 2005, and June 2011 in Survey Unit 7W, Wrangell- St. Elias National Park & Preserve.

Moose (*Alces alces*) utilize drainage bottoms around Gold Hill and portions of the higher drainage basins that contain suitable low shrub forage. Moose are common but not abundant in the area. Moose likely forage on the mining claims primarily in the riparian zone where preferred browse exists. Moose habitat includes tall shrub on slopes less than 55 percent and coniferous, deciduous and mixed forest vegetation types. There have been no fall/winter moose surveys conducted specifically within the Gold Hill area. Wrangell-St. Elias National Park & Preserve staff conducted a moose survey in the major drainages of the Nutzotin Mountains surrounding the Gold Hill area during 1998. Moose density was low to medium, estimated at 0.84 moose/mi², and overall bull:cow:calf ratios were healthy at 65:100:34. Moose surveys that included Tetlin National Wildlife Refuge and the northern slopes of the Nutzotin Mountains and lower Chisana River drainage (north of the Gold Hill area) were conducted by Tetlin NWR staff. Moose densities were low, ranging from 0.28 to 0.62 moose/mi² between 2000 and 2008. Bull:cow:calf ratios averaged 76:100:35. Summer densities are expected to be somewhat lower.

Grizzly bear (*Ursus arctos*) range throughout the Gold Hill area. Although no Grizzly den sites have been identified in the area, all parts of the Gold Hill study area, including the and Shamrock Group is considered Grizzly bear habitat. Grizzly bear habitat includes coniferous forest, low and tall shrub and alpine tundra.

Golden eagles (*Aquila chrysaetos*) and gyrfalcons (*Falco rusticolus*) have been observed nesting in the Gold Hill area. Aerial surveys for cliff nesting raptors near mining claims were conducted in 1992. There were two golden eagle nesting territories within the Gold Hill study area and two additional territories just outside the study area boundary near Alder Gulch and Chavolda Creek. Golden eagles are long lived and may defend a nesting territory for many years. Golden Eagles feed primarily on snowshoe hare (*Lepus americanus*), arctic ground squirrel (*Spermophilus parryii*), hoary marmot (*Marmota caligata*), willow ptarmigan (*Lagopus lagopus*), and seasonally on Dall's sheep (*Ovis dalli*) lambs and caribou (*Rangifer tarandus*) calves. Short Eared Owl (*Asio flammeus*) and Merlin (*Falco columbarius*) adults with young have been observed hunting in the area, and nest on cliffs above Cathenda Creek.

Additional species which occur in the area include Red fox (*Vulpes vulpes*), wolf (*Canis lupus*), coyote (*Canis latrans*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), pika (*Ochotona collaris*), ermine (*Mustela erminea*), snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), ground squirrels, willow ptarmigan (*Lagopus lagopus*) and a variety of songbirds, waterfowl and shorebirds. Brewers sparrows (*Spizella breweri ssp. taverni*) nest in the Gold Hill area. This is the northern most range known for the species. Nesting occurs in low willows and dwarf birch on steep (30-40 degree) slopes on S-SE exposures at subalpine/alpine interface. This suggests no nesting would occur in mining areas. Parasitic Jaegers (*Stercorarius parasiticus*) were observed nesting on Gold Hill in 1990.

No federally listed threatened or endangered wildlife species are known to be residents of, or otherwise make use of, the mining claims or surrounding area. However, golden eagles are protected by the Bald Eagle Act and both golden eagles and gyrfalcons are protected by the Migratory Bird Treaty Act.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 METHODOLOGY AND IMPACT CRITERIA

The direct, indirect, and cumulative impacts are described for each issue (impact topic). The impacts for each issue are based on the intensity (magnitude), duration, and context (extent) of the impact. Summary impact levels (negligible, minor, moderate, or major) are given for each issue. Definitions are provided below.

4.1.1 Intensity

Low:	A change in a resource condition is perceptible, but it does not noticeably alter the resource's function in the park's ecosystem, cultural context, or visitor experience.
Medium:	A change in a resource condition is measurable or observable, and an alteration to the resource's function in the park's ecosystem, cultural context, or visitor experience is detectable.
High:	A change in a resource condition is measurable or observable, and an alteration to the resource's function in the park's ecosystem, cultural context, or visitor experience is clearly and consistently observable.

4.1.2 Duration

Temporary:	Impacts would last only a single visitor season or for the duration of discreet activity, such as construction of a trail (generally less than two years).
Long term:	Impacts would extend from several years up to the life of the plan.
Permanent:	Impacts are a permanent change in the resource that would last beyond the life of the plan even if the actions that caused the impacts were to cease.

4.1.3 Context

Common:	The affected resource is not identified in enabling legislation and is not rare either within or outside the park. The portion of the resource affected does not fill a unique role within the park or its region of the park.
Important:	The affected resource is identified by enabling legislation or is rare either within or outside the park. The portion of the resource affected does not fill a unique role within the park or its region of the park.
Unique:	The affected resource is identified by enabling legislation and the portion of the resource affected uniquely fills a role within the park or its region of the park.

4.1.4 Overall Summary Impact Levels

Summaries about the overall impacts on the resource synthesize information about context, intensity, and duration, which are weighed against each other to produce a final assessment. While each summary reflects a judgment call about the relative importance of the various factors involved, the following descriptors provide a general guide for how summaries are reached.

Negligible:	Impacts are generally extremely low in intensity (often they cannot be measured or observed), are temporary, and do not affect unique resources.
Minor:	Impacts tend to be low intensity or of temporary duration, although common resources may have more intense, long-term impacts.
Moderate:	Impacts can be of any intensity or duration, although common resources are affected by higher intensity, long-term impacts while unique resources are affected by medium or low intensity, temporary impacts.

Major: Impacts are generally medium or high intensity, long term or permanent in duration, and affect important or unique resources.

Extensive placer mining and associated land development and disturbance occurred in the Chisana-Gold Hill Study area in the period of 1913 – 1945. These actions, undertaken at a time when measures to protect the environment were all but non-existent, caused widespread, long-term impacts in the area on soils, water resources, floodplains, and vegetation, among other resources. These conditions are documented in Chapter 3 and briefly described below in section 4.1.6. As currently managed, the area is part of the Chisana-Gold Hill Historic District, which is listed on the National Register of Historic Places. Returning the area to a pristine condition would not be consistent with management to maintain the cultural landscape of the Historic District. Therefore, the following discussion of impacts uses the previously disturbed landscape as a baseline, rather than a pristine condition.

4.1.5 Impairment

Impairment of a park resource(s) occurs when a resource would no longer fulfill the specific purposes identified in the park's enabling legislation (or proclamation) or its role in maintaining the natural or cultural integrity of the park, as described in the park's GMP, foundation document, or other significant guiding plans. An impairment determination will be attached to the decision document for this project.

4.1.6 Cumulative Impacts

Cumulative impacts are the effects that would result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Interactive impacts may be either *countervailing* – where the net cumulative impact is less than the sum of the individual impacts or *synergistic* – where the net cumulative impact is greater than the sum of the individual impacts. Cumulative impacts were assessed by combining the potential environmental impacts of this action's alternatives with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

Past Activities

Past activities in the Chisana-Gold Hill Study Area include mining and hunting. When the park was established there were 30 placer claims encompassing approximately 550 acres and two lode claim blocks (Big Eldorado containing 60 claims and 1200 acres, and lode claims on upper Little Eldorado Creek). Past mining activities disturbed the creek bed extensively, physically disrupting stream channels and altering riparian vegetation and aquatic life. The loss of riparian habitat reduced nutrient sources to stream systems, and reduced wildlife habitat. Construction of trails, water diversion ditches and tailings piles altered stream flow and modified wetlands and destroyed major portions of some fluvial systems. Soils and vegetation along access trails, water ditches, at camps and in the drainage bottoms and their adjacent upland slopes remain disturbed.

Approximately 10 miles of creek bed and associated riparian zones were impacted (Table 6). The natural resources at 7 camp sites with historic structures were also impacted. The NPS estimated that there were 131 acres mapped as disturbed in the Chisana Study Area (NPS, 1990). Field observations and mapping since then indicate that this was an underestimation and many more areas were probably impacted.

Table 6: Drainages Impacted by Past Mining Operations

Creek	Linear Feet	Heavily Impacted
Big Eldorado	9000	Greater than 50%
Gold Run & Tributaries	11500	More than 50%

Little Eldorado	4000	Most
Little Eldorado Tributaries	1200	50%
Bonanza Creek	26500	Most
Total linear distance	52200	

The Chisana-Gold Hill Landscapes study identifies many historic features associated with past mining operations in the area. Trails and an airstrip were constructed and/or developed for motorized vehicle travel overland and into the area. The area of disturbance from these trails is estimated at 10 acres assuming an average 8-foot width. Most of these trails have been used periodically, but fairly continuous since the 1950's. Many miles of historic foot, sled and horse trail cross the historic landscape. The motorized trails include:

Table 7: Past - Existing Trails

Historic Structure/facility	Distance feet
Chicken to Little Eldorado Camp	6500
Little Eldorado Camp to Bonanza No. 5	4100
Little Eldorado Camp to Shamrock Camp	6000
Shamrock Claim	1200
Segment No 8 Pass	3000
Chicken to Big Eldorado Claims	16500
Big Eldorado to Gold Run Camp	1400
Chicken to Upper Gold Run Camp	6600
Segment No 8 Pass to Bonanza No.1	4400
Chicken Creek landing strip	1400
Big Eldorado Claim Trail	2000
Total linear distance	53,100

Present Activities:

Mining operations on Bonanza and Big Eldorado Creeks and to a lesser extent Gold Run and Little Eldorado presently occur or have occurred within the past 15 years. Currently there are 25 placer claims encompassing 456 acres near Gold Hill. Over the past 5 years BLM mineral examiners have also operated suction dredges and highbankers conducting mineral examinations on unpatented claims on Bonanza, Little Eldorado, Gold Run and Big Eldorado Creeks. BLM field operations ceased at the end of 2012.

The proposed suction dredge and highbanker mining activities would be confined a 9.6 acre area within Shamrock Group on lands that were impacted previously by mining. Likewise suction dredge and highbanker operations would continue within Bonanza Nos. 1 to 6 on lands also impacted by past mining. ORV use to access these operations would continue on the established trails between the Chicken Creek

landing strip and those claims. The Shamrock claimants would also access their claims with ORVs along existing trails. The area is popular with sport hunters who fly into Chicken Creek landing strip. Gold Hill and associated uplands are within a Sport Hunting Concessions Area. Sport hunters base activities from Chicken Creek landing strip. Few recreational visitors travel to Gold Hill each year to explore the historic landscape and surrounding area.

Future Activities:

A Gold Hill mineral development scenario was included in the 1990 WRST Cumulative Impacts of Mining EIS to project future possibilities. Mining operations on Bonanza Creek and Shamrock Group are likely to continue for 10 years or more. We do not foresee claimant Fales undertaking approved heavy equipment operations on Big Eldorado Creek, but we do anticipate that suction dredge mining operations similar in scope to Shamrock would be proposed for Little Eldorado and Gold Run Creeks. Quantitative analysis of cumulative impacts to key resources and issues of concern would be conducted for any new proposed operations at Gold Hill (NPS, 2000).

4.2 ANALYSIS OF IMPACTS

4.2.1 Cultural Resources

Alternative 1: No Action

Direct and Indirect Impacts: The NPS would not permit mining activities; there would be no direct impacts to cultural resources from mining activities. Cultural resources would only be impacted by the passage of time and natural forces, which would be direct, low-intensity, long-term impacts. Without the human presence on the claims, portable artifacts could be removed by visitors, who could also damage or destroy structures or cultural features (either intentionally or unintentionally). This would result in minor indirect impacts to cultural resources.

Cumulative Impacts: Past mining activities have shaped the historic landscape to roughly its current configuration, although activities later than the period of significance for the Historic District may have altered it in unknown ways. Although the cultural resources have been well documented and mapped, NPS has no plans for any large-scale recovery or collection of artifacts or any significant structural preservation operations.

Conclusion: The combination of direct and indirect and cumulative impacts under this alternative would result in a minor impact to cultural resources.

Alternative 2: Proposed Action with Stipulations

Direct and Indirect Impacts: Active mining on the scale proposed would not significantly alter the integrity of the landscape of the historic district. The CLR proposed active mining as a suitable treatment for these claims, with the caveat that it not degrade, destroy, or alter the landscape, structures, or artifacts. Although there may be temporary impacts to individual artifacts that need to be moved during mining operations, they would be replaced when finished so the impact would be minimal and of low intensity. Moving of artifacts will need to follow the guidance provided by NPS, see Appendix E. The proposed uses and repairs of the structures, if done with in-kind materials, would be a moderately positive, long-term impact that would help retain the structures and the landscape.

Cumulative Impacts: Mining and access to mining has had and will continue to have moderate impacts to the landscape, but these impacts created and are in keeping with the historic character of the landscape. These impacts have been and will continue to be moderate in intensity.

Conclusion: Alternative 2 would result in direct and cumulative, long-term positive impacts to cultural resources.

4.2.2 Floodplain

Alternative 1 - No Action

Direct and Indirect Impacts: Under the no-action alternative no new direct and indirect impacts to floodplains would occur.

Cumulative Impacts: Bonanza Creek is an integral part of the Chisana Historic Mining Landscape. The NPS has chosen to manage the Gold Hill area and Bonanza Creek for its historic value and therefore preservation and restoration of the historic landscape take precedent over natural resources and processes. Multiple historic features and structures have been identified. Wooden remnants of boomer dams and linear hand-stacked tailings rows are situated within the active floodplains and channel. These adversely impact the floodplain function within the Shamrock Group. Peak discharge occurs during spring snow melt/runoff and summer rainstorm events. The barren streambed between side slopes and the sparsely-vegetated floodplain are periodically inundated.

All of the 2650 linear feet of stream bed within the Shamrock claim group has been mined. The entire 5-mile length of Bonanza Creek including all reaches upstream and downstream of the claims were mined or impacted by mining. During normal flow conditions, one or two channels are active and the stream has a braided character. During floods the barren streambed, inactive channels, portions of the adjacent sparsely-vegetated floodplain gravel bars and banks are covered by water.

Natural processes are slowly reclaiming the disturbed landscape within the claim block. The channel is dynamic and the adjacent streambed is barren and “braided”. Floodwaters periodically alter the historic landscape and its component features. Loss of vegetation and soils and a dysfunctional floodplain have increased the ability for floodwaters to cause erosion. Past mining activities and continued small-scale mining and access to mining have resulted in medium intensity, long-term impacts to the floodplain. This has resulted in a moderate impact.

Conclusion: Under the no-action alternative no new impacts to floodplains would occur. Most floodplains and associated resources at Gold Hill including those within the claim block were impacted by mining. Overall these were moderate. NPS management of the cultural landscape and protection of associated historic features in the floodplain would continue have a moderate adverse impact on the floodplain function and values.

Alternative 2 – Proposed Action with Stipulations

New Impacts: Approximately 2650 linear feet of creek bed and adjacent floodplain would be affected. Mining operations affect the active floodplain by processing channel and bank gravel bars and temporarily altering local stream channel configuration and flow. Impacts generally consist of pulling up and mixing the stream substrate by dredge and by hand and laying the substrate back during discharge and reclamation. The mining and exploration dredging operations would not have any impacts to the floodplain downstream of the dredging. Reclamation performed concurrently with all operations would minimize alterations to the floodplain and potential affects to the stream floodplain ecosystem. Historic cabins and the established mining support facilities that would be used under this plan are located outside the active floodplain.

Suction dredge placer mining operations would be, by necessity, conducted within the active floodplain of Bonanza Creek. Some highbanker operations would occur in the sparsely vegetated floodplain. These mining operations would have temporary and low intensity affects on the floodplain and stream channel because it is a barren floodplain over most reaches of the stream within the claim block. Since the floodplain substrate is primarily gravel and cobbles with very little riparian vegetation, proposed mining activities would result in minor direct and indirect impacts to floodplains.

Cumulative Impacts: Past placer mining described under Alternative 1 has had moderate impacts to most floodplains in the Gold Hill Area. The past and present impacts to floodplains would be expected to remain though gradually lessen with natural recovery over time.

Conclusion: Alternative 2 would result in minor direct and indirect negative impacts to local floodplains. Combined with moderate impacts from past, present, and reasonably foreseeable activities, this would result in moderate impacts to floodplains. Executive Order 11988 Floodplain Management has been considered in this environmental assessment and a Floodplains Statement of Findings has been prepared (Appendix D).

4.2.3 Socioeconomics

Alternative 1 - No Action

Direct and Indirect Impacts: Under the no action alternative there would be a direct long-term adverse impact to the claimants and their prior existing right because they would not be able to mine or realize any potential economic benefit. There would be no ability to recapture any investment of time or money pertaining to claim purchase, claim validation, equipment purchase and/or develop the MPO. Although there would be a major negative long-term impact to the claimants; we anticipate a minor indirect impact to the local economy.

Cumulative Impacts: Suction dredge mining operations have only been undertaken on Bonanza Creek and Big Eldorado Creek placer claims at Gold Hill since 1986. Placer operations were greater in number and duration prior to 1986. A heavy equipment placer mining operation was approved but not undertaken in 2000. Currently there is only one authorized operation at Gold Hill. That operation is within Bonanza Nos. 1-6 and is recreational in character. Those operations are conducted by a group of recreational miners using metal detector, suction dredges and highbanker equipment. Between 2 and 4 individuals operate each summer for a period of 1 to 4 weeks. The financial returns to the claimants are unknown but sufficient to warrant continuation each summer. The claimants utilize a local air taxi to access Gold Hill but acquire most of their supplies, material and equipment from non-local sources. These activities have resulted in a minor benefit to the socioeconomic environment.

Conclusion: Under the no-action alternative no mining operations would be authorized adversely affecting the socioeconomic environment. The overall socioeconomic impact would be minor.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Alternative 2 would benefit the area's socioeconomic environment both directly and indirectly. A new mining operation would provide temporary financial returns to the claimant and their operators by developing their mining plan. It would be recreational in character and only involve a few individuals who do not reside in the area. Financial benefits are unknown. The Shamrock claimants own aircraft, hence they are unlikely to utilize an air taxi service. They acquire most of their supplies, material and equipment from non-local sources. Anticipated beneficial impacts to the local economy would be negligible and would not constitute any long-term benefit.

Cumulative Impacts: The past and present impacts to the socioeconomic environment described above would be expected to remain, and potentially gradually increase over time. Small scale placer mining on Bonanza Creek would occur on two claim blocks: the Bonanza Nos. 1 to 6 and the Shamrock Group. These authorization mining operations would provide temporary financial returns to the claimant and their operators. Both mining operations are recreational in character and hence these would likely provide insignificant short- term financial benefits.

Conclusion: The overall socioeconomic impact would result in negligible direct and indirect, minor cumulative beneficial impacts to the local socioeconomic environment.

4.2.4 Soils

Alternative 1 - No Action

Direct and Indirect Impacts: Under the no-action alternative no new impacts to soils would occur.

Cumulative Impacts: Past mining activities have adversely impacted soils and soil development on more than 130 acres within the Chisana –Gold Hill area which prior to mining were essentially pristine. These areas currently have no soil, sparse vegetation and/or no permafrost. Approximately 9 acres of gravel, rock, and limited mineral soil are exposed on the Shamrock Group. Loss of vegetative cover has promoted thermokarst (permafrost thaw) and erosion of soils. Additionally there are landslides, barren stream beds, and floodplains without any naturally occurring soil. These lack any organic soil cover. Past and present access trails in the area have resulted in soil displacement, compaction, and loss on approximately two acres. These activities have resulted in medium intensity, permanent impacts to a common park resource and have resulted in minor impacts to area soils.

Conclusion: Direct and indirect impacts combined with cumulative impacts from past and reasonably foreseeable mining would result in a minor impact to soils.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Dredging barren gravel bars would result in minimal soil loss and negligible additional impacts to floodplain soils because there are no soils in the channel. Highbanker operations would be confined to barren or disturbed lands with limited or no soil development. Hence this impact would be short-term and negligible. Soils in the tributary draws would be impacted but these are small areas and concurrent reclamation would minimize impacts. Digging small holes at metal detector locations would cause direct short-term impacts to established soils outside the floodplain, upland barren benches and tributary draws, but concurrent reclamation would also minimize those impacts. Hence overall there would be negligible impacts to soil resources but mining would delay succession in areas with soils.

Cumulative Impacts: Same as described above under Alternative 1. These past, present, and reasonably foreseeable actions have resulted in a minor impact to area soils.

Conclusion: Alternative 2 would result in negligible direct and indirect low negative impacts to local soils. Combined with the cumulative impacts of past and reasonably foreseeable actions, this would result in a minor impact to area soils.

4.2.5 Vegetation

Alternative 1 - No Action

Direct and Indirect Impacts: Under this alternative, no Mining Plan of Operations would be authorized for the Shamrock claims. No mining activities would take place. There would be no new impacts to vegetation and no potential for additional introduction of invasive plants.

Cumulative Impacts: Past and present actions that have impacted vegetation in the project area include clearing for past mining activities and associated logging for construction materials and heating fuel; construction of the Chicken Airstrip; use of ATV access supply routes; and horse grazing. Such activities have altered, damaged, and destroyed local vegetation, although some of that damage has been naturally mitigated by subsequent revegetation. We estimate that 19.7 acres, or 69% of the Shamrock Group consists of previously disturbed landscape and vegetation. Change detection between satellite imagery in the 1980's to more recently, shows that much of the originally disturbed land is in some stage of vegetation recovery. To date no invasive plant species have been documented in the Gold Hill area.

These impacts are medium intensity and temporary and affect a common park resource. They have resulted in a minor impact to area vegetation.

Conclusion: Direct and indirect impacts to vegetation would be negligible and natural recovery would continue to occur. Combined with the impacts of past, present, and reasonably foreseeable actions, this alternative would result in minor impacts to area vegetation.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Alternative 2 would result in some direct loss of existing vegetation due to mining activities, including some of the recovered areas. Disturbed area resulting from suction dredge and high-banker operation is estimated at approximately 1 acre over a ten-year period. Due to disturbance and activity there will also be an increased risk of introducing non-native vegetation to the site. It is not anticipated that any of the 4 AKNHP rare plants will be affected by the mining due to their distribution and habits. These activities would result in temporary, medium-intensity impacts to a common park resource and would result in minor direct and indirect effects to vegetation.

Cumulative Impacts: The past and present impacts to vegetation described above would be expected to remain, though gradually lessening over time because of natural recovery. Past, present and reasonably foreseeable future actions have resulted in minor impacts to area vegetation.

Conclusion: Alternative 2 would result in minor direct and indirect impacts to vegetation. Combined with the minor cumulative impacts from past, present, and reasonably foreseeable actions, this would result in a minor impact to area vegetation.

4.2.6 Wetlands

Alternative 1 - No Action

Direct and Indirect Impacts: Under this alternative, no Mining Plan of Operations would be authorized for the Shamrock claims. No mining activities would take place. There would be no new impacts to wetlands.

Cumulative Impacts: Past mining disturbance and periodic flooding have altered the stream channel and floodplain such that it is difficult to know what wetlands were originally there. Much of the original disturbance to the wetlands remains through contributing historical artifacts, such as boomer dams, ditches, and tailings piles. NPS has decided to preserve these features in order to preserve the cultural

landscape of a historic district. It is worth noting that the previous miner, Thorall, was asked by the NPS for a bond to be used to re-establish disturbed wetlands post-mining. Although, Thorall had a much more intensive mining operation, NPS was unable to detect measureable changes in wetlands from year to year and returned the bond in full. Floodplain bars contain scrub-shrub wetlands in various stages of development along the stream channel.

Conclusion: Direct and indirect impacts to wetlands would be negligible and natural recovery would continue to occur. Combined with the impacts of past, present, and reasonably foreseeable actions, this alternative would result in minor impacts to area wetlands.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Alternative 2 would result in some temporary, direct loss of wetlands due to mining activities. The claimants plan on mining approximately 450sqFt/yr (apprx. 0.01acres/yr), mostly within the riverine wetlands in the stream bed. Stipulations for the miners to use reclamation as an ongoing process during all phases of the mining operation will help minimize impacts to wetlands. Actions such as the suction dredge would return processed gravel directly to the stream as it exits the sluice and leveling out any tailings piles at the end of the field season combined with the natural dynamics of this glacially fed system will result in a temporary, yearly disruption of wetland functions and features of 0.01acre a year. Based on past monitoring of similar mining activities, this area will be fully recovered within the next year (Cook 1990). Disturbed wetland area resulting from suction dredge and high-banker operation is estimated at approximately 1 acre over a ten-year period. All of these wetlands have been previously disturbed by previous miners and much of the disturbance is maintained in historic structures (such as boomer dams, ditches, and tailings piles), that are managed in order to preserve the cultural landscape of an historic district. Wetland disturbance of .01 acres per year in a previously disturbed riverine wetland would not degrade the natural and beneficial ecological, social/cultural, or other functions and values of wetlands. The activities would result in temporary, medium-intensity impacts to a common park resource and would result in minor direct and indirect effects to vegetation and wetlands.

Cumulative Impacts: The past and present impacts to vegetation described above would be expected to remain, though gradually lessening over time because of natural recovery. Past, present and reasonably foreseeable future actions have resulted in minor impacts to area vegetation.

Conclusion: Alternative 2 would result in minor direct and indirect impacts to wetlands, in particular the riverine wetlands (within the stream bed). Combined with minor impacts from past, present, and reasonably foreseeable activities, there would be a minor impact to wetlands that would not degrade the natural and beneficial ecological, social/cultural, or other functions and values of wetlands.

4.2.7 Visitor Use

Alternative 1 - No Action Alternative, No Mining Operations Authorized

Direct and Indirect Impacts: Under this alternative, no mining activities would take place. There would be negligible impacts to visitor use and experience.

Cumulative Impacts: Past and present mining activities and impacts are described in section 4.1.6 of this document. Past mining activities have resulted in landscape disturbances, including stream channel and riparian disturbance, historic roads and trails, cabins and other structures associated with mining camps, and other infrastructure associated with mining. To some visitors who come seeking natural character and solitude, these landscape features would represent negative impacts to the natural character of the area. Other visitors would find them of historical interest, and some visitors may come specifically because of an interest in past mining activities in the area.

Present mining operations would include suction dredge and highbanker operations within Bonanza Nos. 1 to 6. ORV use to access these operations would continue on the established trails between Chicken Creek airstrip and those claims. Noise from operation of equipment would be audible within the immediate area and local drainages. Impacts associated with present mining use would result in temporary impacts (impacts related to noise) of low intensity to a small number of visitors. This could result in displacement of a small number of visitors.

Because of the combination of positive and negative impacts associated with past and historic mining activities, past and present activities in the area would result in a minor impact to visitor use and experience.

Conclusion: This alternative would result in negligible direct and indirect impacts to visitor use. Combined with minor impacts from past, present, and reasonably foreseeable activities, impacts to visitor use would be minor.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Under this alternative, mining activities would occur sporadically from June 1 to September 30. The natural character of the area for recreational users would be negatively impacted by the noise and visual intrusion associated with the occupancy of the base camp and mining operations. Noise from operating equipment would be audible within the immediate area and local drainages. These sounds would alter the natural quiet of the area. Similarly the presence of motorized vehicles and equipment, neither of which is part of the natural landscape, would degrade some visitor experiences. Recreational use of the area is low, and those individuals that do visit the area know it has a history of past and current mining. Impacts to visitors would be temporary and of a medium intensity, affecting a small area that could easily be avoided, even for visitors on foot. These impacts would result in minor direct and indirect impacts to visitor use and experience.

Cumulative Impacts: Same as described for Alternative 1 above. Because of the combination of positive and negative impacts associated with past and historic mining activities, past and present activities in the area would result in a minor impact to visitor use and experience.

Conclusion: Alternative 2 would result in minor direct and indirect impacts to visitor use and experience. Combined with cumulative impacts from past and present mining activities in the area, this would result in minor impacts to visitor use and experience.

4.2.8 Visual Resources

Alternative 1 - No Action Alternative, No Mining Operations Authorized

Direct and Indirect Impacts: Under this alternative, no mining activities would take place on the Shamrock claims. Direct and indirect impacts to visual resources would be negligible.

Cumulative Impacts: Past and present impacts are described in section 4.1.6 of this document. Past mining activities impacted approximately 10 miles of creek bed and associated riparian zones. Natural resources at 7 camp sites were also impacted. The NPS estimated there were 131 acres mapped as disturbed in the Chisana study area (NPS, 1990). Field observations and mapping since then indicate that more areas were probably impacted. Present mining operations would include suction dredge and highbanker operations within Bonanza Nos. 1 to 6 on lands also impacted by past mining. ORV use to access these operations would continue on the established trails between Chicken Creek airstrip and those claims.

Past and present mining has created visual impacts in the form of creek bed and riparian disturbance. More obvious visually are the historic roads that have become ORV trails. These linear features have created visual scars across the landscape. However, these are features that are important components of the cultural landscape within a National Register Historic District. As such, the visual evidence of past and present mining has a positive impact on the cultural landscape and will add to the experience of most visitors.

Conclusion: Alternative 1 would result in negligible direct and indirect impacts to visual resources. Combined with cumulative impacts from past and present mining activities, this would result in maintenance of the cultural landscape of a National Register historic district and a positive impact to visual resources.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: This alternative would result in mining activities, including use of a suction dredge and highbanker in areas previously disturbed by mining. Annual area of disturbance from these activities is estimated to be very low (less than one acre per year). Access to the claims would utilize existing airstrips and ORV trails. Impacts would be long-term and low intensity and would result in minor impacts to visual resources.

Cumulative Impacts: Past and present mining has created visual impacts in the form of creek bed and riparian disturbance. More obvious visually are the historic roads that have become ORV trails. These linear features have created visual scars across the landscape. However, these are features that are important components of the cultural landscape within a National Register Historic District. As such, the visual evidence of past and present mining has a positive impact on the cultural landscape and will add to the experience of most visitors.

Conclusion: Alternative 2 would result in minor direct and indirect impacts to visual resources. Combined with cumulative impacts from past and present mining activities, this would result in maintenance of the cultural landscape of a National Register historic district and a positive impact to visual resources.

4.2.9 Water and Aquatic Resources

Alternative 1 - No Action

Direct and Indirect Impacts: Under the no-action alternative no new impacts to water resources would occur on parklands resulting from authorization to mine. Erosion from natural disturbances (high water) would affect water quality and natural processes would continue to slowly reestablish pre-mining conditions.

Cumulative Impacts: Stream resources were heavily impacted and degraded in the Gold Hill area by past mining operations that altered channel and floodplain morphometry on Bonanza, Little Eldorado, Gold Run and Big Eldorado Creeks. Repeated placer mining in the creek beds and hydraulic mining of upland benches increased fine sediment loads and degraded water quality. Surface water diversions caused reduced natural flow regimes. Mining operations directly and adversely affected water quality through the loss of wetlands, riparian habitat, vegetation cover and soils. Although most of the soils and fine sediments have been flushed from the floodplain river systems, these disturbed lands continue to be subject to higher levels of erosion. At least 131 acres in the Gold hill area were mined; these continue to contribute a sediment load and degradation to water quality, especially during periods of heavy rain fall and flooding. Most creeks met water quality standards during periods of low or normal flow (USGS, 1999 and Appendix H). Mined fluvial systems in Gold Hill are slowly recovering through natural

processes. These systems will not return to pre-mining conditions because of the scope of the past mining and the NPS approach to management and protection of the historic mining landscape. Vegetation is slowly reestablishing in disturbed areas that were mined; it helps stabilize slopes and mineral soils. Present populations of macro invertebrates at Gold Hill probably reflect those typically found in naturally occurring disturbance environments but are probably less diverse than what existed prior to mining the stream.

All the floodplain and channel within Shamrock Group have been mined, and some upland benches. The Shamrock Group impacted stream resources encompass approximately 8.4 acres. Bonanza Creek downstream of Shamrock Group contains approximately 3.25 miles of highly impacted stream bed with moderate recovery, stabilization and limited revegetation. Two miles of the channel and associated floodplain upstream of Shamrock Group were also impacted; these floodplains have limited revegetation.

Water quality data has been gathered on Bonanza Creek (Appendix H). Turbidity and solids carried by the stream are highly variable. This turbidity is in part due to non-point source pollution resulting from historic mining and unvegetated uplands. These impacts to water resources are long-term, medium intensity to an important park resource. They have resulted in moderate impacts to water resources.

Conclusion: Under the no-action alternative no new impacts to water resources would occur on preserve lands; combined with moderate impacts from past, present and reasonably foreseeable actions, this alternative would have a moderate impact on water resources.

Alternative 2 – Proposed Action with Stipulations

Direct and Indirect Impacts: Monitoring of suction dredge operations on Bonanza Creek indicates that the material being mined from the bed of Bonanza Creek would predominately be gravel and coarse sand with minor amounts fine sand and silt. Water quality data collected while a suction dredge processed material on Bonanza Creek indicates that, upon reentering the stream from the sluice, coarse material would settle out relatively quickly. A small volume of fine material would be carried downstream but would settle out within several hundred feet. Shutting dredge operations off would stop the input of sediment and the water would clear up within several minutes.

Suction dredge mining operations would have short-term impacts on water quality from increased sediment load and turbidity proximal to the dredge or where highbanker waters would be returned to the channel. Turbidity and total suspended solids (TSS) would be elevated above background immediately below the discharge point. This turbidity increase would likely exceed background by 5 NTU or more (NPS, 1995). After the discharge plume has mixed with the stream flow, turbidity and TSS would steadily decrease. Monitoring indicates that at 500 feet below the suction dredge, operations would generally meet water quality standards or return to a condition that approximates water quality parameters upstream of operations. This would be greatly dependent upon the existing stream discharge and background conditions at the time of mining. Other water quality parameter would not be significantly greater below the suction dredge; however, manganese levels may be elevated in the 100 feet below the dredge, but these levels would also decrease.

The limited aquatic resources of Bonanza Creek would be affected by the restructuring of stream substrate as a result of suction dredging. Some disturbance of the sparse plant biomass and macro invertebrates would occur. Impacts would be negligible over previously disturbed and naturally scoured reaches of the stream as a result of dredging operations.

The average measured stream discharge on the claims is approximately 1.4 cfs; the minimum observed is 0.22 cfs. The average flow translates to approximately 625 gpm. An 80 gpm estimated rate of water

usage would not reduce flow in Bonanza Creek because the water used during dredging would be immediately returned to the stream by the dredge. We anticipate that the operator may switch to a 4- inch or smaller dredge during periods of low flow. Hence overall the discharge of Bonanza Creek would not change.

Overall, the direct and indirect impacts from mining activities would be temporary and low impact on an important park resource. These would result in minor impacts to water resources.

Cumulative Impacts: Park staff anticipate that three or four suction dredge mining operations may be proposed or undertaken at Gold Hill during the next decade. Chisana LLC and/or James Moody have conducted suction dredge operations within the channel of Bonanza Creek since the 1970's; this will continue. Fales conducted suction dredge operations on Big Eldorado in the 1990s. These operations have ceased. During 2000, Fales was authorized to mine in Big Eldorado but he has not conducted any operations in over 10 years and there is no indication that he would undertake placer mining in that drainage in the foreseeable future (NPS, 2000). In addition, the Little Eldorado and the Gold Run claimants have expressed an interest in submitting plans of operations for suction dredging within those stream channels.

Stream resources were heavily impacted and degraded in the Gold Hill area by past mining operations that altered channel and floodplain morphometry on Bonanza, Little Eldorado, Gold Run and Big Eldorado Creeks. These fluvial systems are slowly recovering through natural processes. All the floodplain and channel within Shamrock Group have been mined and impacted. The Shamrock Group impacted stream resources encompass approximately 8.4 acres. Bonanza Creek downstream of Shamrock Group contains approximately 3.25 miles of highly impacted stream bed with moderate recovery, stabilization and limited revegetation. Two miles of the channel and associated floodplain upstream of Shamrock Group were also impacted; these floodplains have limited revegetation.

The objective of the stream resource impact evaluation is to measure the change in the physical and chemical features of stream corridors caused by past mining and mining under the proposed alternatives. The stream resource index model includes water quality (C1), stream morphometry (C2) and sediment loading (C3) components (NPS, 1990). The quality of the stream ecosystem is measured using a Stream Resource Index (SRI). Quantity of stream environment equals the total stream area, measured in acres. Stream Resource Units (SRU) were developed for Bonanza Creek and the Gold Hill area based on the SRI and applicable acreage (NPS, 1990). Many of the component scores are subjective. Several of the V1-V9 SRU variables are difficult to quantify because of assumptions, limited sampling, sorting out cause and effect and assessing the degree to which the systems have recovered.

In this EA it was assumed that existing resource values would not change for reaches unaffected by mining operations would result in any change in SRU. The analysis anticipates operations continuing on Bonanza Nos. 1-6 and operations commencing on the Shamrock Group, approximately 0.75 miles upstream of that claim block. NPS monitoring of suction dredge operations within Gold Hill (Bonanza Nos. 1-6 claims and Big Eldorado Creek) has shown that none of the eight variables are adversely or significantly affected by suction dredge operations. Therefore, the Bonanza Creek 1986 and current SRU levels would probably be maintained. The mining EIS estimated a total Gold Hill Study Area pre-mining SRU of 78.1 and a 1986 SRU level of 64.8.

Since the only other mining operations at Gold Hill at this time is within Bonanza Nos. 1-6 and NPS monitoring of those operations on Bonanza Creek indicates that there is no effect on SRUs, our analysis focuses on proposed operations within the Shamrock Group which would potentially cause cumulative stream resource effects and degradation. The SRI model for Bonanza Creek was applied using the current data set (Table 8). Additional water quality data are presented in Appendix H. Proposed mining

operations would affect approximately 2650 linear feet of creek bed with a wetted width between 10 and 30 feet, containing approximately 1 acre (0.86). For the proposed mining reach, the model yields a 2013 SRI of 0.95 and a SRU of 0.85. Currently less than 0.1 SRUs have been lost or degraded within the proposed mining reach (channel). There are approximately 3.1 acres of channel and barren floodplain within the Shamrock Group. Application of the SRU model to those resources would yield an SRU of 2.95 with a potential loss of less than 0.2 SRUs (Table 8).

The proposed mining area is within a previously disturbed fluvial system. The impacts to water resources from past, present, and reasonably foreseeable actions described above are long-term and medium intensity to an important park resource. They have resulted in moderate impacts to water resources.

Conclusion: Alternative 2 would result in minor direct and indirect minor negative impacts to local water resources. Combined with moderate impacts from past, present, and reasonably foreseeable activities, alternative 2 would result in a moderate impact to water resources.

Table 8: Bonanza Creek Shamrock Group Stream Resource

Variable, type	Variable #	Present -2013	Variable index	Description	Component	Component Low Score
Turbidity, low flow	V1	<5ntu	1.0	Less than NPDES standard	C1	
pH	V2	~ 8.0	1.0	Approximates conditions upstream of mining	C1	
Settle able Solids		Tr				
Suspended Sediments		< 2.0				
# Metals > 1986 EPA	V3	None	1.0	USGS sampling affirms	C1	
Hazardous Materials	V4	Low	1.0	Minor petroleum products limited to refueling on onsite	C1	1.00
Channelization percent	V5	0	1.0	Braided stream, no confined channels, functional floodplain covered with sparse vegetation; some historic features affect flow during floods	C2	
Streamside Vegetation	V6	1.2	0.95	1.2 acres upland bench within 46 acres over 2500 linear feet	C2	0.95
Fish Obstructions	V7	4	1.00	No fish or habitat, probably never was	C2	
Disturbance in 400 buffer	V8	2.5 acres channel	0.90	Limited disturbance upstream outside proposed mining area, past activities confined to floodplain, braided stream	C3	0.90
Acres disturbance upstream	V9	2.5 acres channel	1.00	Limited disturbance upstream outside proposed mining area, past activities confined to floodplain, braided stream	C3	

Note #1 (wetted perimeter only):

Shamrock Group Stream reach area: 0.85 acres

Shamrock Group SRI: 0.95

Shamrock SRU = SRI x area = 0.82

Note #2 (channel and barren floodplain):

Shamrock Group Stream reach area: 03.11 acres

Shamrock Group SRI: 0.95

Shamrock SRU = SRI x area = 2.95

4.2.10 Wildlife

The 2008 landcover data (Section 3.5, Table 4) was used to determine the total pre-mining condition (undisturbed + disturbed) and existing condition (undisturbed) of habitat in the Chisana-Gold Hill study area for each of the 4 species of interest (Table 9). The impacts from the Shamrock Group Mining Operations Plan (Alternative 2), projected condition, and projected condition as a percentage of the pre-mining condition for each species is presented in Table 10.

Table 9: Total pre-mining condition (undisturbed + disturbed) and existing condition (undisturbed) of habitat in the Chisana-Gold Hill study area for each of the 4 wildlife species of interest

Vegetation Class	Premining Acres in Gold Hill Study Area	1986 Mining Disturbance in Gold Hill Study Area	Existing Conditions	Caribou Habitat	Dall's Sheep Habitat	Moose Habitat	Grizzly Bear Habitat
Coniferous forest	645.4	5.0	640.4	X		X	X
Deciduous forest	86.7		86.7	X		X	X
Mixed forest	38.1		38.1	X		X	X
Tall shrub	142.1	3.0	139.1	X	X	X	X
Low shrub	4,256.3	120	4,136.3	X	X	X	X
Dwarf shrub	2,810.0		2810.0	X	X		X
Herbaceous	3,169.4		3169.4	X	X	X	X
Sparse	725.6		725.6		X		X
Barren	1,904.4	2.0	1902.4		X		X
Water/Glacier	1.5		1.5			X	X
Unknown	59.8		59.8				

Table 10: Projected condition, and projected condition as a percentage of the pre-mining condition for each species

	Premining Acres in Gold Hill Study Area	Past Impact	Existing Conditions	Impacts From Alternative	Projected Condition	Projected Condition As Percentage of Premining Condition
Caribou	11,148.0	128.0	11,020.0	9.59	11,010.4	98.8
Dall's Sheep	13,007.8	125.0	12,882.8	9.59	12,873.2	99.0
Moose	8,339.50	128.0	8,211.5	9.59	8,201.9	98.4
Grizzly Bear	13,779.5	131.0	13,649.5	9.59	13,639.9	99.0

Alternative 1 - No Action

Direct and Indirect Impacts: Under the no-action alternative, there would be no new impacts to vegetation, resulting in no new loss of wildlife habitat. If no mining were to occur, wildlife habitat in the 19.7 acres previously disturbed would continue to recover.

Cumulative Impacts: Past activities in the Chisana-Gold Hill Study Area include mining and hunting. Past mining activities have resulted in landscape disturbances, including stream channel and riparian disturbance, historic roads and trails, cabins and other structures associated with mining camps, and other infrastructure associated with mining. Past mining activities disturbed approximately 10 miles of creek bed and associated riparian zones, physically disrupting stream channels and altering riparian vegetation. Trails and an airstrip were constructed and/or developed for motorized vehicle travel overland and into the area. The area of disturbance from these trails is estimated at 10 acres. Such activities have altered or destroyed wildlife habitat, and created aversion areas, disturbing and disrupting wildlife use. The NPS estimated that there were 130 acres mapped as disturbed in the Chisana-Gold Hill Study Area (NPS, 1990), however field observations and mapping since then indicate that many more areas were probably impacted. Much of the originally disturbed land is in some form of vegetation recovery. The Shamrock Group consists of 19.7 acres of previously disturbed landscape and vegetation.

The analysis anticipates operations commencing on the Shamrock Group Claim, directly impacting 9.59 acres consisting of vegetated and barren floodplain, barren upland, and tributary stream habitat. The projected condition as a percentage of the pre-mining condition of habitat within the Chisana-Gold Hill Study Area ranges from 98.4 % to 99.0% for the 4 target wildlife species (Table 10). The impact is of low intensity and of either short to long term duration depending on the destruction of shrubs or herbaceous vegetation. The loss would be insignificant due to the availability of additional habitat elsewhere. Dall's sheep, moose, and grizzly bear are common and widely distributed throughout the park and preserve. Chisana caribou have a more limited range, have experienced previous notable population declines and therefore might be more vulnerable to short and long term loss of habitat.

Past, present, and reasonably foreseeable future activities would have a temporary to long-term, low intensity effect on an important park resource. Based on these factors and the limited acreage relative to the analysis area, these actions will have a minor impact on wildlife.

Conclusion: Alternative 1 would have negligible direct and indirect impacts on wildlife. Combined with minor impacts from past, present, and reasonably foreseeable future activities, impacts from Alternative 1 would be minor.

Alternative 2 – Proposed Action with Stipulations

New Impacts: Under this alternative, mining activities would occur annually, though sporadically from June 1 to September 30. Mining activities, including noise and the associated human presence, would disturb and/or disrupt wildlife use of the local area. Noise from operating equipment and motorized vehicles would be audible within the immediate area and local drainages. Moose and caribou calving, if occurring in the local area, could be impacted as calving can extend into early June. The direct impact, temporary displacement, is of low intensity and temporary duration. Human presence and the associated food stored in the mining camp, might increase bear-human encounters and could result in loss of grizzly bears due to "Defense of Life and Property" kills. Such encounters can be mitigated if the camp is kept clean and food is stored in bear proof containers as stated in the stipulations of this EA. Indirect impacts of noise and human presence may lead to year long or long term avoidance of the area. Dall's sheep, moose, and grizzly bear are common and widely distributed throughout the park & preserve. Chisana caribou have a more limited range, have experienced previous notable population declines and therefore might be more vulnerable to short and long term disruptions.

Mining activities would also result in a temporary loss of vegetation or wildlife habitat. The activities would directly affect 9.59 acres consisting of 3.11 acres of barren floodplain, 4.84 acres of vegetated floodplain, 1.2 acres of barren upland, and 0.44 acres of tributary stream habitat. Vegetation consists mainly of herbaceous and low shrub classes. The direct and indirect impacts would be of low intensity and long term duration and would result in a minor impact to wildlife. Once mining activity is completed, the area would remain affected while the disturbed habitat slowly recovers by natural processes.

Cumulative Impacts: Same as described under Alternative 1.

Conclusion: Alternative 2 would result in minor direct and indirect impacts to wildlife resources, being of low intensity and temporary to long term duration. Combined with minor impacts resulting from past, present, and reasonably foreseeable actions, Alternative 2 would result in a minor impact to wildlife.

5.0 COORDINATION AND CONSULTATION

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