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National Forests

St. Joe
Ranger District

December 2006

Final Environmental Impact Statement

Emerald Creek Garnet Area

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Emerald Creek Garnet Area
Final Environmental Impact Statement

Idaho Panhandle National Forests, St. Joe Ranger District
Latah County, Idaho
December 2006

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Abstract: The final environmental impact statement (FEIS) addresses needs for public recreational garnet gemstone digging at the Emerald Creek Garnet Area operated by the Forest Service in the East Fork of Emerald Creek on the St. Joe Ranger District. The project area is approximately 780 acres of National Forest System lands including 281 Gulch, Garnet Gulch, No Name Gulch, Pee Wee Gulch, and a portion of the East Fork of Emerald Creek.

Issues: The major issues include: wetlands, water quality and water yield, aquatic habitat, and recreation including availability of the garnet area and public access for garnet digging.

Alternatives: Alternatives considered in detail include:

Alternative A – Phasing Out the Garnet Area: The public dig site would remain in 281 Gulch with new methods of operation to protect water quality and aquatic habitat while reducing safety risks until the accessible garnet gemstone resource is depleted then the facility would be closed and the site would be rehabilitated.

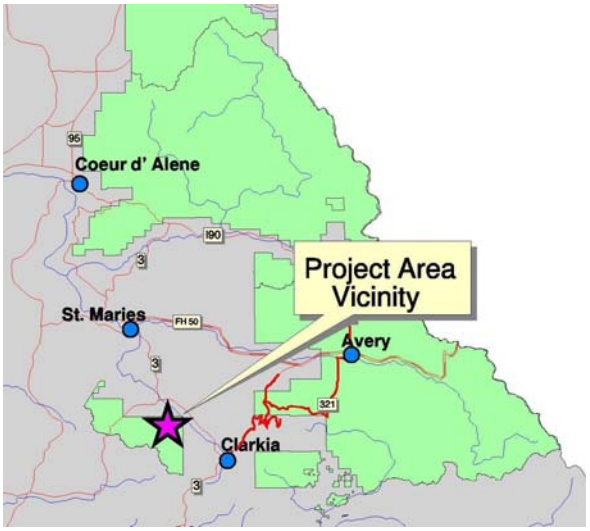
Alternative B – Proposed Action: Public recreational digging would continue with new methods of operation to protect water quality and aquatic habitat while reducing safety risks. Operations would be moved to Garnet Gulch when the garnet resource in 281 Gulch is depleted. Vehicle access to the digging site would be limited to administrative and disabled access.

Alternative C – Proposed Action with Additional Access for Vehicles: Similar to Alternative B, but access to the operations site would be provided for all vehicles except extra large vehicles (buses, large RVs, etc.).

Summary
Emerald Creek Garnet Area
Final Environmental Impact Statement

Introduction

This environmental impact statement addresses needs for the public recreational garnet gemstone digging at the Emerald Creek Garnet Area which is operated by the Forest Service in the East Fork of Emerald Creek on the St. Joe Ranger District of the Idaho Panhandle National Forests. The Emerald Creek Garnet Area Project Area includes approximately 780 acres in Latah County, Idaho. All of the project area is National Forest System land. It includes 281 Gulch, Garnet Gulch, No Name Gulch, Pee Wee Gulch and a portion of the East Fork of Emerald Creek drainages in T42N, R1E, Boise Meridian.



Purpose and Need

The purpose of this project is to continue to provide a public recreational area for collecting gem-quality star garnets while providing public safety and protecting water quality and aquatic habitats.

A decision needs to be made whether or not to continue the public recreational digging area and if so, what drainage to enter and what operation methods are needed to comply with federal and state regulations and to protect resources. The primary questions are if and how to safely allow gemstone collecting and still protect wetlands and beneficial uses associated with water quality and aquatic habitat.

The Emerald Creek Garnet Area has long been known as a unique gem-collecting area in northern Idaho. This area is known internationally for its rare star garnets. It is the only site in the United States and one of two sites in the world where star garnets are found. The star garnet is the state gemstone for Idaho. The Forest Service has operated a fee recreational digging site in Emerald Creek for the public since 1974. The recreational garnet area is nearing the end of available area to dig at the present site in 281 Gulch. There is considerable public support for the present Emerald Creek Garnet Area and future recreational garnet gemstone digging opportunities.

Gemstone garnet deposits primarily occur in the drainage bottoms and, therefore, digging areas are typically within the riparian zone of the streams. Digging garnets in riparian areas with the current operation method leaves a riparian area excavated for the entire season which results in sediment production that may affect water quality and aquatic habitat.

The digging area is currently within the streambed and in the adjacent banks. Garnets are found in gravel just above bedrock. At this time, the public is allowed to pick a spot in the stream and dig their own holes through the subsoil for garnet gravels. They do this working in close vicinity of others with hand tools. There are inherent safety risks for the diggers and for the Forest Service employees who monitor the activity. The size and location of the holes have to be controlled to ensure safe operations. The safety risks include possible injury from hand tools and possible collapse of stream banks, trees or rocks.

Random hand digging of the garnets results in an incomplete recovery of the garnet resource. Often people dump the subsoil from their holes onto another site where garnets may never be recovered. The result is that the recovery of the garnets is haphazard and not complete.

Most of the National Forest System lands within the project area were either acquired through land donations or land exchanges (Weeks Law, Clarke-McNary, General Exchange Act and Administrative Sites Act). These acquired lands are not open to mineral entry under the general mining laws as are most other National Forest System lands in the western United States. Whether or not to develop minerals in these acquired lands is a discretionary decision. In other words, the Forest Service may use the land to

develop minerals but is not required to do so. These minerals are subject to mineral leasing laws and procedures (For more detail on laws and authorities, see the Minerals Section in Chapter 3 and Appendix B). Mineral development is also allowed (Section 402 of Reorganization Plan No. 3 of July 16, 1946) when it will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as are specified by the Secretary of Agriculture in order to protect such purposes.

The Forest Service acquired the lands within the project area through land exchanges in the 1960s and 1970s for the purposes of garnet collecting and land consolidation. These land exchanges received a great deal of publicity and subsequent comment from the public. The public demonstrated enormous support to maintain opportunities for recreational gem collecting. This land was considered key to consolidating National Forest System land and improving recreation management of rockhound activities for removal of gem–quality garnets.

Proposed Action

The Forest Service proposes to continue public recreational collecting at the Emerald Creek Garnet Area with new methods of operation to protect water quality and aquatic habitat and provide safer garnet-collecting conditions for visitors and Forest Service employees (see Chapter 2 for details). Operations would continue in 281 Gulch until the accessible garnet gemstone resource is depleted. At that time, operations would move from 281 Gulch to Garnet Gulch. Road 3781 which currently provides access would be decommissioned and completely recontoured. A new road would be constructed to the new operations area in Garnet Gulch to provide access for administration and people with disabilities. A new trail would be constructed from Road 447 to the new access road. The Forest Service would rehabilitate previously dug areas in Pee Wee, No Name and 281 Gulches to improve aquatic habitat and maintain water quality. The Pee Wee Gulch parking lot on Road 447 would be rehabilitated, and the flood plain would be restored.

Alternative Development

Scoping

Public scoping for the Emerald Creek Garnet Area began in December 2004. A mailing list was generated by using rock club lists; Emerald Creek Garnet Area visitors lists; resident mailing list for Clarkia, Idaho (the nearest town); and known interested parties such as neighboring landowners, environmental groups, other government agencies and school teachers who are known to conduct garnet area field trips. On December 20, 2004 the St. Joe Ranger District mailed a Scoping Notice to 965 individuals, organizations, and agencies. The Scoping Notice was also posted on the Idaho Panhandle National Forests web site at that time. The project was listed on the Quarterly Schedule of Proposed Actions in January 2005.

News releases were also sent to the following regional and local papers: Spokesman–Review, St. Maries Gazette Record, Moscow-Pullman Daily News, Lewiston Morning Tribune and Shoshone News Press. A Notice of Intent (NOI) to publish an environmental impact statement appeared in the Federal Register on February 3, 2005. Both the Scoping Notice and NOI described the purpose and need and proposed action for this project.

Forest Service employees staffed a booth at the Rock Rollers Gem and Mineral shows in Spokane, Washington in March 2005 and March 2006. They provided information and handed out flyers describing the proposal and asking for comments.

The Forest Service received 93 responses from this scoping effort. These responses were primarily from people who have participated in recreational digging at the garnet area.

On February 23, 2006 I sent copies of the Emerald Creek Garnet Area Draft Environmental Impact Statement to people on the mailing list discussed above and to the mailing list supplied by the Army Corps of Engineers. The Environmental Protection Agency published a notice of availability for the EIS on March 10, 2006. That notice stated that the public comment period would end on April 24, 2006. On March 13, 2006 I published a legal notice that announced the EIS was available and requested public comments. I received 20 letters commenting on the DEIS. The interdisciplinary team reviewed the comments and responded to them by completing additional analysis, correcting errors, and clarifying some discussions. The comments and the Forest Service's Response to Comments are included as Appendix B in the final EIS.

Issues

Issues were identified based on public comments, the knowledge and experience of the interdisciplinary team, and preliminary analysis of the proposed action. Alternative-driving issues include Wetlands, Water Quality and Quantity, Aquatic Habitat, and Recreation (availability of the garnet area and public access to it).

Alternatives Considered in Detail

Alternative A – Closing the Garnet Area

The garnet collecting site would remain in 281 Gulch until the accessible garnet gemstone resource is depleted then the facility would be closed and the site would be rehabilitated. New operation methods would be used. Rehabilitation from past operations would be completed including decommissioning and recontouring Road 3781. All facilities would be removed including toilets, administration building, and parking areas. Effectiveness of rehabilitation and closure of garnet digging area would be monitored. The floodplain at the parking lots (281 Gulch and Pee Wee Gulch) would be partially reestablished leaving space for turnouts.

Alternative B – Proposed Action

The Forest Service proposes to continue public recreational garnet collecting at the Emerald Creek Garnet Area with new methods of operation to protect water quality and aquatic habitat (see FEIS Chapter 2 and Appendix A for details). Operations would continue in 281 Gulch until the accessible garnet gemstone resource is depleted. At that time, operations would move from 281 Gulch to Garnet Gulch. A new road would be constructed to access operations in Garnet Gulch. A trail would be constructed connecting existing Road 447 with the new road. A parking lot would be constructed to accommodate people with disabilities and administrative vehicles. With information collected from surveys and exploration during 2002-2004, the Forest Service developed an operations and reclamation plan to address water and fish concerns for the remaining area in 281 Gulch and the new proposed area in Garnet Gulch. The Forest Service would rehabilitate previously dug areas in Pee Wee, No Name and 281 Gulches to improve aquatic habitat and maintain water quality.

Alternative C

A number of the public comments and comments from the interdisciplinary team suggested a need for road access all the way to the collecting site at Garnet Gulch once operations move from 281 Gulch. There was concern that the proposed trail is too long for some people which would exclude them from the site. This alternative is the same as Alternative B except it includes making the new road available for everyone (not just administration and people with disabilities) to the Garnet Gulch collecting site with a larger parking (three acres of clearing).

Comparison of Alternatives

Meeting the Purpose & Need

Maintains the recreation gemstone collecting area while protecting aquatic habitat and water quality / quantity	No	Yes	Yes
Provides safer, more efficient operation method	Yes	Yes	Yes

Addressing the Issues

Please see Chapter 3 of the FEIS for a complete discussion of these issues.

Wetlands

Activity is proposed in a total of one acre of wetland in 281 Gulch and 2.2 acres in Garnet Gulch over 12 to 24 years.

There would not be an appreciable change in flow or circulation through the wetland areas for the following reasons: 1) annual disturbance in wetland areas would be small (1/5 to 1/3 acre or less) and temporary (one week or less); 2) current survey data of valley and channel cross-sections and longitudinal profiles would be used to reconstruct the channel; 3) each reconstructed panel surface, both wetland and channel(s), would match upstream and downstream valley and channel elevations and channel locations.

No wetlands would be lost. In all alternatives, parking lots would be removed along the East Fork of Emerald Creek resulting in ½ to 1 ½ acres of floodplains and wetlands rehabilitation which equates to a net gain of wetlands.

In Alternative A no wetlands would be lost from project activities. One acre in 281 Gulch of wetlands would be temporarily disturbed during excavation and concurrent reclamation. Approximately 1½ acres of floodplain/wetland would be reestablished along East Fork Emerald Creek through parking lot removal at Pee Wee Gulch and 281 Gulch.

In Alternatives B and C no wetlands would be lost from project activities. A total of approximately 2.2 acres of wetlands in Garnet Gulch and one acre of wetlands in 281 Gulch would be temporarily disturbed during excavation and reclamation over the life of the project. The annual rate of wetland

disturbance when excavating riparian areas may be about one-quarter acre in 281 Gulch and about 0.35 acre in Garnet Gulch. The planned removal and restoration of parking area at Pee Wee Gulch along the East Fork Emerald Creek may increase floodplain and wetlands by about ½ acre, resulting in a net increase in wetlands and floodplains.

Water Quality / Water Yield

Estimated Amount of Sediment Production and Reduction: Sediment additions from proposed activities are estimated at approximately 5.0 tons/year although design features may reduce estimated sediment generated during channel reconstruction. Sediment basins, sediment traps, gravelling, slash-filter-windrows, vegetated buffers and other safeguards listed under the Design Features would be utilized to prevent sediment from entering the stream system from the recreational operations. Past turbidity sampling at the current collection areas indicates that water quality standards are met with the pre-sluice operations and would continue to be met with the proposed new operations.

Effects on Stream Temperature: There may be an incremental fraction of increased sunlight on the stream channels, but this would not be a consequential increase in direct sunlight on the stream channel and would not cause further impairment of beneficial uses within the East Fork Emerald Creek. The topography of the surrounding landscape and the orientation of the drainages shade the drainage bottoms, the removal of trees and shrubs would not result in a large increase of sunlight reaching the streams, and shrub and tree planting will eventually shade streams; so temperature would not increase.

Effects to Beneficial Uses: Pollutants of concern for downstream reaches that are listed as Water Quality Limited Segments (WQLS) include sediment and temperature. No change to existing beneficial uses is expected because past monitoring indicates sediment levels met water quality standards at the recreational garnet collection site, temperature increases are not expected because the minor change in vegetative cover will not reduce stream shading, proposed tree and shrub planting will eventually increase shade, and no change to water quality is expected from the introduction of chemical pollutants.

Water Withdrawal vs. Stream Flow: No increase in water yield is expected because no consequential change in vegetative cover would occur from this activity. Water withdrawal is not expected to substantially affect wetland hydrology or streamflow because the vast portion of water withdrawal would occur in the springtime during higher flow periods to fill the holding/settling pond(s) for the sluice operations. It is anticipated there would be a need to replenish water in the holding/settling pond(s) due to leakage, evaporation, and spills and splashing from the sluice operation. This anticipated need is not expected to be large. The system would be recharged with water from the stream source after review by the District Fish Biologist and District Hydrologist. During dry periods, only a small portion of the stream flow over an extended time period would be removed for augmentation or a water truck may be used to supplement if needed.

Aquatic Habitat

Fisheries: The table on the following page summarizes effects for fisheries. For these issues, there are no differences between Alternatives B and C. The proposed activities would not jeopardize the continued existence of bull trout, the listed species that historically was found in the project area. The proposed activities would maintain habitat and thus would not affect the fishery potential.

Amphibians: Western toads have been found at various locations in the analysis area, in both riparian and upland habitats and near the garnet digging site in 281 Gulch. For Alternative A, the continuation of recreational mining for garnets in 281 Gulch would impact approximately one acre of riparian habitat. For Alternatives B and C, Forest Service recreational mining of garnets would impact a total of approximately 3.2 acres of riparian habitat in 281 Gulch and Garnet Gulch.

Based on the confirmed presence of western toads, alteration of habitat would likely impact potential breeding habitat for the western toad. It is also likely that there would be some short-term displacement of individuals and some unavoidable direct mortality of individuals associated with the mining operation. However, this impact has not been shown to eliminate western toads from the drainage. Western toads have been seen in the small water-filled depressions that result from garnet digging, in the settling ponds used to reduce sediment at the existing site and at a rehabilitated commercial mining site. All areas impacted by mining would be rehabilitated in the same year as excavations. This rehabilitation would be designed to restore – as much as possible – breeding habitat for western toads. The fact that adult toads commonly use upland habitats also provides an avenue of escape from direct mortality.

Comparison of Alternatives by Stream by Fisheries Issue Indicator

	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
% RHCA Vegetation Disturbance	3	3	3	0	8	8	n/a	n/a	n/a
% Fish-Bearing Channel Alteration Annually	3	3	3	0	4	4	n/a	n/a	n/a
Cumulative % Fish-Bearing Channel Alteration (recent & future mining)	53	53	53	0	40	40	3	4	4
Road Density	3.8	3.8	3.8	3.9	4.6	4.6	3.9	3.9	3.9

Recreation

As noted in Chapter 1, a decision needs to be made whether or not to continue the public recreational garnet collecting area. Whether or not this opportunity is available is of utmost importance to rockhounds, lapidaries, local schools and businesses and casual visitors. For all alternatives, new methods for garnet discovery and collection are proposed in order to protect water quality, aquatic habitat, provide the public as safe an environment as possible and to fully recover the garnet resource. The recreational experience at the Emerald Creek Garnet Area is described in Chapter 3.

Access for current operations on 281 Gulch includes a parking lot off of the East Fork of Emerald Creek Road 447 and a 0.4 mile hike using a gated road (Road 3781) to the dig site administrative building. People with disabilities are allowed to make arrangements for driving up Road 3781 to the administrative A-frame building. Until operations in 281 Gulch are complete (two to four years) this access will remain the same for all Alternatives.

For Alternatives B and C, operations would continue and be moved to Garnet Gulch. Different access would be needed. Alternative B would require most people (except disabled) to hike along a new trail and road from the 281 Gulch parking lot to the garnet collection site, 3,493 feet or 0.66 mile. The proposed hike for Alternative B up to Garnet Gulch would be longer and would also be steeper (up to 12% on the trail portion) than the current hike required to 281 Gulch. Alternative C would allow everyone except people in buses and RVs to be able to drive directly to the Garnet Gulch site.

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CHAPTER ONE - PURPOSE AND NEED FOR ACTION

Introduction

This environmental impact statement addresses needs for the public recreational garnet gemstone collecting area (Emerald Creek Garnet Area) operated by the Forest Service in the East Fork of Emerald Creek on the St. Joe Ranger District of the Idaho Panhandle National Forests. The responsible official for this decision is the Forest Supervisor, Idaho Panhandle National Forests, 3815 Schreiber Way, Coeur d'Alene, Idaho, 83815.

The Emerald Creek Garnet Area Project Area is approximately 780 acres located in Latah County, Idaho. All of the project area is National Forest System land. It includes 281 Gulch, Garnet Gulch, No Name Gulch, Pee Wee Gulch and a portion of the East Fork of Emerald Creek drainages in T42N, R1E, Boise Meridian (see Appendix H: Map 1 – Vicinity and Project Area Maps).

This Final Environmental Impact Statement (FEIS) was prepared pursuant to Council on Environmental Quality (CEQ) and United States Army Corps of Engineers (USACE) regulations implementing the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.). NEPA requires federal agencies to consider the environmental effects of their actions. It requires that an EIS be prepared for major federal actions significantly affecting the quality of the human environment. The EIS must provide detailed information regarding the proposed action and feasible alternatives, the environmental impacts of the alternatives, potential mitigation measures, and any adverse environmental impacts that cannot be avoided if the proposal is implemented. Agencies are required to demonstrate that these factors have been considered by decision makers prior to undertaking actions. The US Army Corps of Engineers has determined that issuance of a Clean Water Act (CWA) §404 permit to the USDA Forest Service for the recreational garnet operations would constitute a "major federal action" and thus requires an EIS.

Purpose and Need for Action

The purpose of this project is to continue to provide a public recreational area for collecting gem-quality star garnets while providing public safety and protecting water quality and aquatic habitats.

The Emerald Creek Garnet Area has long been known as a unique gem-collecting area in northern Idaho. This area is known internationally for its rare star garnets. It is the only site in the United States and one of two sites in the world where star garnets are found. The star garnet is the state gemstone for Idaho. The Forest Service has operated a fee recreational garnet removal site in Emerald Creek for the public since 1974. The recreational garnet area is nearing the end of available area to recover garnets at the present site in 281 Gulch. There is considerable public support for the present Emerald Creek Garnet Area and future recreational garnet gemstone collecting opportunities (PF: PD-7b).

A decision needs to be made whether or not to continue the public recreational garnet area and if so, what drainage to enter and what operation methods are needed to comply with federal and state regulations and to protect resources.

Gemstone garnet deposits primarily occur in the drainage bottoms and, therefore, collecting areas are typically within the riparian zone of the streams. Digging garnets in riparian areas with the previous operation method left a riparian area excavated for the entire season which may increase risks to beneficial uses associated with water quality and aquatic habitat.

The garnet area is currently within the streambed and in the adjacent banks. Garnets are found in gravel just above bedrock. At this time, the public is allowed to pick a spot in the stream and dig their own holes through the subsoil for garnet gravels. They do this working in close vicinity of others with hand tools. There are inherent safety risks for the public and for the Forest Service employees who monitor the activity. The size and location of the holes have to be controlled to ensure safe operations. The safety risks include possible injury from hand tools and possible collapse of holes, stream banks, trees or rocks.

Random hand digging of the garnets results in an incomplete recovery of the garnet resource. Often people dump the subsoil from their holes onto another site where garnets may never be recovered. The result is that the recovery of the garnets is haphazard and not complete.

The primary questions are if and how to safely allow gemstone collecting and still protect beneficial uses associated with water quality and aquatic habitat.

Acquired Lands and Mining Law

Most of the National Forest System lands within the project area were either acquired through land donations or land exchanges (Weeks Law, Clarke-McNary, General Exchange Act and Administrative Sites Act). These acquired lands are not open to mineral entry under the general mining laws as are most other National Forest System lands in the western United States. Whether or not to develop minerals in these acquired lands is a discretionary decision. In other words, the Forest Service may use the land to develop minerals but is not required to do so. These minerals are subject to mineral leasing laws and procedures (For more detail on laws and authorities, see the Minerals Section in Chapter 3 and Appendix B). Mineral development is also allowed (Section 402 of Reorganization Plan No. 3 of July 16, 1946) when it will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as are specified by the Secretary of Agriculture in order to protect such purposes.

The Forest Service acquired the lands within the project area through land exchanges in the 1960s and 1970s for the purposes of garnet collecting and land consolidation. These land exchanges received a great deal of publicity and subsequent comment from the public. The public demonstrated enormous support to maintain opportunities for recreational gem collecting. This land was considered key to consolidating National Forest System land and improving recreation management of rockhound activities for removal of gem–quality garnets.

Forest Plan Direction

The purpose and need for this project is based on Forest Service policy and direction given in the Idaho Panhandle National Forests' Forest Plan (referred to as the Forest Plan from here on). The Forest Plan specifically states that the Emerald Creek Garnet Area will be managed to provide a unique rockhound experience (See below under Management Area 4). Standards for minerals (pg II-34) that apply to this project are:

1. …... Cooperate with federal and state agencies charged with the responsibility of administering laws, rules and regulations pertaining to the minerals resource and mining operations.
2. Facilitate the exploration and development of critical minerals to the extent practicable, consistent with protection and management of surface resources.

Some of the Forest-wide standards (pg II-24) for recreation are:

1. The Forest will continue to provide a share of recreation opportunities and diversity in relation to other public and private entities;
2. Provide a broad spectrum of dispersed and developed recreation opportunities in accord with identified needs and demands.

Forest Plan direction under the Inland Native Fish Strategy (INFS) is presented in the Fisheries section in Chapter 3.

The project area is located within the following Forest Plan Management Areas (MA):

MA 4: Under MA 4, the Forest Plan states "The Emerald Creek Garnet area will be managed to provide a unique recreation rockhound experience and in accord with its current management direction". For more detail see pages III-17-20.

MA 15 (grazing uses). For more detail see pages III-65-67.

MA 16 (riparian areas) goals are to "meet or exceed state water quality standards, protect soil productivity, provide opportunities for dispersed recreation consistent with riparian protection requirements ". For more detail see pages III-68-72.

There are no specific standards for minerals in the Forest Plan by individual management area. More information for each Management Area is in the Forest Plan.

Proposed Action

The Forest Service proposes to continue public recreational collecting at the Emerald Creek Garnet Area with new methods of operation to protect water quality and aquatic habitat and provide safer and more efficient garnet-collecting conditions for visitors and Forest Service employees (see Chapter 2 and Appendix A for details). Operations would continue in 281 Gulch until the accessible garnet gemstone resource is depleted. At that time, the operations would move from 281 Gulch to Garnet Gulch. Road 3781 which currently provides access would be decommissioned and completely recontoured. A new road would be constructed for administrative and disabled access to operations in Garnet Gulch, and a new trail would be constructed from Road 447 to the new access road. With information collected from surveys and exploration during 2002-2004, the Forest Service developed an operations and reclamation plan to address water and aquatic concerns for the remaining area in 281 Gulch and the new proposed area in Garnet Gulch. The Forest Service would rehabilitate previously dug areas in Pee Wee, No Name and 281 Gulches to improve aquatic habitat and maintain water quality. A portion of the floodplain would be reestablished at the Pee Wee Gulch parking lot leaving a space for a vehicle pull-through.

Scope of the Project

The scope of the project refers to both the geographical area affected and timeframe of the proposal, including any connected or cumulative actions.

The geographic scope of the Proposed Action includes recreational garnet removal and associated development in the 281 Gulch and Garnet Gulch which are tributaries of the East Fork of Emerald Creek. It also includes rehabilitation work along the East Fork of Emerald Creek. Chapter 2 presents site-specific proposed actions and alternatives. Other present and reasonably foreseeable activities would occur within the cumulative effects areas (see Chapter 3 for details). These reasonably foreseeable future activities are included in each pertinent resource analyses for this DEIS under cumulative effects.

With all alternatives public garnet collecting activities would continue in 281 Gulch for two to four years then rehabilitation activities would begin. With Alternatives B and C garnet removal would begin in Garnet Gulch in two to four years then would continue for another 10 to 20 years. Total activities in Alternatives B and C would occur on an estimated 14 to 16 acres (Appendix A p.1; PF: PD-50) over a period of 12 to 24 years.

CHAPTER TWO – ALTERNATIVES

This chapter describes alternatives and their features. It describes the alternative development process that includes scoping and public involvement, issue identification, and development of alternatives. It presents detailed information about each alternative, compares them and then discusses alternatives considered but were eliminated from detailed study.

Substantive Changes Between Draft EIS and Final EIS

Additional scoping information was included under "Alternative Development" section. Issue Indicators were updated to better reflect watershed analysis. Better explanations about Alternatives A and B were added. More discussion was added to Alternatives Considered but Eliminated from Detailed Study to show other alternatives that were considered. The Draft EIS discussed an alternative called "No Mining in Riparian Areas". In the FEIS this alternative is called "No Mining in Floodplains" to better describe what the alternative included. Figures 2-5 were updated to clarify the information displayed.

Alternative Development

Scoping

Public scoping for the Emerald Creek Garnet Area began in December 2004. A Scoping Notice was mailed to 965 individuals, organizations, and agencies on December 20, 2004 and was also presented on the Idaho Panhandle National Forests web site. The project was listed on the Quarterly Schedule of Proposed Actions in January 2005. Mailing lists were generated by using rock club lists; Emerald Creek Garnet Area visitors lists; resident mailing list for Clarkia, Idaho (the nearest town); and known interested parties such as neighboring landowners, environmental groups, other government agencies and school teachers who are known to conduct garnet area field trips. Forest Service employees staffed a booth at the Rock Rollers Gem and Mineral shows in Spokane, Washington in March 2005 and March 2006. They provided information and handed out flyers describing the proposal and asking for comments. News releases were also sent to the following regional and local papers: Spokesman–Review, St. Maries Gazette Record, Moscow-Pullman Daily News, Lewiston Morning Tribune and Shoshone News Press. A Notice of Intent (NOI) to publish an environmental impact statement appeared in the Federal Register on February 3, 2005. Both the Scoping Notice and NOI described the purpose and need and proposed action for this project. The Forest Service received 93 responses from this scoping effort. These responses were primarily from people who have participated in recreational digging at the Emerald Creek Garnet Area.

The Forest Service released the Draft EIS for the Emerald Creek Garnet Area on February 23, 2006 when it mailed copies of the DEIS to people on the project mailing list and to the mailing list provided by the Army Corps of Engineers. The DEIS was posted on the IPNF website at that time. On March 10, 2006 the Environmental Protection agency published a notice of availability for the DEIS in the Federal Register. That notice stated the comment period for the DEIS would end on April 24, 2006. Copies of the DEIS and comment forms were available to the public at the Rock Rollers Gem and Mineral Show in Spokane, Washington in March 2006. The Forest Service published a legal notice in the *Spokesman-Review* on March 13 that announced the availability of the DEIS and asked for comments. The Forest Service received 20 letters and e-mails regarding the DEIS. The comments and the Forest Service's response to them are included as Appendix B of the FEIS.

The U.S. Army Corps of Engineers is a cooperating agency for this proposal, and the Forest Service has worked with the Army Corps of Engineers throughout the development of the proposal and development of alternatives. The Army Corp of Engineers has jurisdiction for project only because it is the agency that has the authority to issue permits for operations in wetlands under Section 404 of the Clean Water Act. The Army Corps of Engineers issued a Public Notice of Application for Permit on March 14, 2006 to solicit public comments as part of the process for issuing a 404 permit to the Forest Service. That comment period ended April 13, 2006. I received copies of the comments that were sent to the Army Corps of Engineers, and my staff used them to update the final EIS.

The Forest Service has worked closely with the Idaho Department of Environmental Quality to develop the project proposal and to ensure adequate analysis and documentation for the Clean Water Act Section 401 certification process (PF: PD-7a, PD-21, PD-22, PD-23, PD-36, PI-125, PI-151, PI-152, ACE-17).

District Ranger, Chuck Mark, discussed the project with representatives of the Coeur d'Alene Tribe during meetings on March 21, 2005 and March 24, 2006 (PF: PI-104, PI-121). The St. Joe Ranger District NEPA coordinator discussed the district's planning program with the Nez Perce Tribe's archaeologist, and he said it was not necessary to provide him with information about projects on the district unless they are close to the North Fork of the Clearwater (PF: PI-106).

On May 5, 2006 the Environmental Protection Agency (EPA) published a notice of availability of EPA comments in the Federal Register.

Issues

Issues were identified based on public and agency comments, the knowledge and experience of the interdisciplinary team, and analysis of the proposed action. Four types of issues were identified: alternative-driving issues, issues addressed with design features, issues which demonstrate possible effects of alternatives, and issues outside the scope of the project analysis (PF: PD-48). Alternative-driving issues and issues addressed with design features and mitigation measures are listed below.

Alternative-Driving Issues

Four key issues were developed from reviewing public comment and internal scoping. They include Wetlands, Water Quality and Yield, Aquatic Habitat, and Recreation

Wetlands

Due to the character of Emerald Creek placer deposits that host the gem garnets, it is necessary to operate within wetlands and the floodplain. Operations in wetlands are regulated by Section 404 of the Clean Water Act and Executive Order 11990. Federal agencies are encouraged to minimize the destruction, loss or degradation of wetlands.

Section 404 of the Clean Water Act regulates the discharge of dredged and fill material into the waters of the U.S. This act requires authorization from the Secretary of the Army, acting through US Army Corps of Engineers (USACE), for the discharge of dredged or fill material into all waters of the U.S., including wetlands. Discharges of fill material in the case of the proposed actions would generally include replacement of fill for site development and other work involving the discharge of fill. A USACE permit is required whether the work is permanent or temporary. The 404 program is administered by both USACE and the U.S. Environmental Protection Agency (USEPA). USACE has the primary responsibility for the permit program and its regulations are promulgated under 33 CFR 321-330. USACE determined that the USFS must obtain a Department of the Army Permit under Section 404 of the CWA.

Information contained in this EIS serves as the analytical basis for a decision whether to issue, issue with modifications or conditions, or deny a CWA §404 permit for the proposed discharge of fill material associated with garnet mining in wetlands and other waters of the U.S. in approximately 2.2 acres in the Garnet Gulch drainage and approximately one acre in the 281 Gulch drainage.

The summary of the EPA's comments as published in the Federal Register on May 5, 2006 stated that the final EIS should augment information on impacts to wetland communities.

Executive Order 11990 encourages federal agencies to take actions to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking federal activities and programs. In addition, this Executive Order establishes a policy on no net loss of wetland for any federal action that may affect wetlands. This requires federal agencies with regulatory authority over actions to avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands if a practicable alternative exists (40 CFR Part 6, Section 302). The proposed

garnet mining in approximately three acres of wetlands over 12-24 years would not result in net loss of wetlands after reclamation is complete because of concurrent reclamation practices. See the Wetlands discussion at the end of this chapter and in Chapter 3, for a discussion of wetland impacts and reclamation and rehabilitation of wetlands along Road 447.

As described in the Purpose and Need section of Chapter 1 and in the discussion above, there is a strong and long history of public support for the continued existence of the recreational garnet collecting area in Emerald Creek. In order to meet that need the Forest Service generated site development plans for exploitation of placer gemstone deposits in the main stem of 281 Gulch and the central reach of Garnet Gulch. Due to the character of the placer deposits which host the gem garnets, it will be necessary to conduct excavation operations within floodplains and riparian areas subject to the provisions of Section 404 of the CWA and other pertinent regulations as outlined above.

Issue Indicator:

- Acres of loss or gain of wetlands

Water Quality and Water Yield

The Environmental Protection Agency's 1998 list of Water Quality Limited Waterbodies (pursuant to Section 303 (d) of the Clean Water Act) includes Emerald Creek downstream of the project area from the confluence of East and West Forks Emerald Creek to the St. Maries River. The proposed action includes activities within tributaries of the East Fork of Emerald Creek. The main stem of Emerald Creek below its forks is listed as not supporting beneficial uses. The main stem of Emerald Creek is listed as impaired from sediment, habitat alteration and temperature modification. A Total Maximum Daily Load (TMDL) was determined for temperature which calls for increasing shade on East Fork Emerald Creek to 100%. The tributary drainages are not identified in this temperature TMDL (ID DEQ, 2003, p. 91). No TMDL was determined for sediment; however, water quality standards require maintenance of existing uses (aquatic life and recreation). Previous or concomitant sediment reductions are required if sediment is generated by proposed activities.

The summary of the EPA's comments as published in the Federal Register on May 5, 2006 stated that EPA supports the goal of reducing impacts to water resources; however, EPA expressed environmental concerns about impacts to water quality and restoring 303(d) listed streams.

Proposed operations include using a sluice, settling ponds and a water recycling system to rinse garnet gravels obtained from stock piled garnet-bearing gravels. This type of operation is proposed partly to protect water quality. Water withdrawals from 281 or Garnet Gulches may be necessary to provide a water source for the garnet operation.

Issue Indicators:

- Estimated amount of sediment production and reduction
- Effects on stream temperature
- Effects to beneficial uses
- Water withdrawal vs. stream flow

Aquatic Habitat

Mining activities would affect the aquatic habitat for project area streams. This DEIS specifically addresses two classes of riparian-dependent animals, fish and amphibians.

Fish: The streams of the project area currently have limiting factors of high temperature, migration barriers, high road densities and, in 281 Gulch, habitat simplification. The proposed activity can affect these factors and in addition can have a negative impact on channel conditions, stream flow and riparian habitat conservation areas (RHCA).

Channel condition and habitat complexity within the channel are closely related and can be directly affected by the proposed mining operation. Stable channels can increase habitat complexity by developing undercut

banks and reducing sediment input which can fill pool habitat. Habitat complexity is related to diversity of habitat composition, amount of woody debris and quality of the habitat that is present (*i.e.* deep pools).

Vegetation of the riparian habitat conservation area can be directly affected by this project and effects to that vegetation can indirectly influence the bank stability, temperature and sediment transport to the stream. Stream banks with more vegetation generally are more stable. Certain types of vegetation make stream banks more stable than others. Vegetation within the RHCA influences temperature regulation by providing shading and can reduce overland sediment flow.

Water withdrawals from 281 or Garnet Gulches may be necessary to provide a water source for the garnet operation. Design features in the minerals and water sections were developed in order to ensure adequate flow to maintain aquatic habitat.

Migration barriers have been identified and the correction of these barriers has been included as a design feature for this project.

Amphibians: Mining activities would also affect riparian areas adjacent to streams. Shallow water from beaver ponds, temporary ponds, slow moving streams, and backwater areas provide potential breeding habitat for amphibians such as the western toad (Maxell, 2000). Loss or alteration of potential breeding habitat may affect amphibian populations (Loeffler, 1998; Mawell, 2000).

Issue Indicators:

- Percent of the fish-bearing stream channel that is altered (fish)
- Percent of the Riparian Habitat Conservation Area (RHCA) disturbed (fish)
- Road density (fish)
- Acres and length of riparian area impacted (amphibians)
- Risk of direct mortality (amphibians)

Recreation

As noted in Chapter 1, a decision needs to be made whether or not to continue the public recreational garnet collecting area. Whether or not this opportunity is available is of utmost importance to rockhounds, lapidaries, local schools and businesses, and casual visitors. For all alternatives, new methods for garnet discovery and collection are proposed in order to protect water quality, aquatic habitat, provide the public as safe an environment as possible and to fully recover the garnet resource (Appendix A). The actual garnet collecting experience for visitors would be very different from the past.

Access for current operations on 281 Gulch includes a parking lot on the East Fork of Emerald Creek Road 447 and a 0.4 mile hike using a gated road (Road 3781) to the administrative building. People with disabilities are allowed to make arrangements for driving up Road 3781 to the administrative A-frame building. Until operations in 281 Gulch are complete (two to four years) this access will remain the same.

If operations move to Garnet Gulch different access would be needed, but the parking lot on Road 447 at 281 Gulch would still be used. Operations would change from a hand-digging site to a site where garnet gravels would be stockpiled yearly using off-road equipment, e.g. an excavator. A permanent road is needed for equipment and administrative access. The proposed action includes constructing a road (0.68 mile or 2/3 mile) up Garnet Gulch and small parking area (one acre) for management of the site and for people with disabilities. The remainder of the public would be required to hike along a new trail and road from the lower 281 Gulch parking lot to the garnet collection site, 3,493 feet or 0.66 mile. The current 281 Gulch hike is 2,075 feet or 0.4 mile along Roads 447 and 3781 to the administrative A-frame building. Thus, the proposed hike up to Garnet Gulch would be longer and would also be steeper than the current hike required for 281 Gulch. Some people have commented that the new road access should be available for everyone to drive.

Issue Indicators:

- Availability of the Recreational Experience
- Public Access

Issues Addressed with Design Features

Some issues are addressed with design features. The environmental effects associated with these issues do not differ between alternatives, and impacts expected, if any, would be minimal. Resources associated with these issues include air quality, noxious weeds, heritage resources, scenery, soils and rare plants. Please see resource discussions in Chapter 3. For all alternatives, appropriate federal and state permits would be obtained.

Alternatives Considered in Detail

During the alternative development process alternatives were considered that were later dismissed and were not analyzed in detail. Discussion about those alternatives follows the descriptions of the alternatives analyzed in detail in this chapter. In addition to issues, the interdisciplinary team considered the following elements while developing alternatives:

- Goals, objectives, standards and guidelines of the IPNF Forest Plan;
- The affected environment as described in Chapter 3;
- Laws, regulations, policies that govern land use of National Forest lands;
- The purpose and need for the project;
- The purposes for which lands in the project area were acquired;
- The scientific findings of the Interior Columbia Basin Ecosystem Management Project.

Alternative A – Phasing Out the Garnet Area

This alternative serves as the no-action alternative required by NEPA. It would give the Forest Service time to notify the public, prepare them for closure of the area, give the public a chance to visit the area before it is no longer available, and complete garnet recovery where facilities are already developed. With Alternative A garnet collecting would continue in 281 Gulch until the accessible garnet gemstone resource is depleted (estimated at two to four years). At that time, the facility would be closed and the site would be rehabilitated.

With information collected from surveys and exploration during 2002-2004, the Forest Service developed an operations and reclamation plan to address water and aquatic habitat concerns for the remaining area in 281 Gulch. The No-Action Alternative includes the following:

- Rehabilitation for previously dug areas in 281 Gulch would be implemented to improve aquatic habitat and assure maintenance of water quality (FEIS, Appendix C). Large, woody debris would be strategically placed in the stream along an estimated 1,000 feet of both Pee Wee and No Name Gulch to enhance aquatic habitat.
- On the West Fork of 281 Gulch no additional sites would be opened up. The new methods would be utilized in 281 Gulch.
- Newly disturbed areas would be an estimated 50-100 feet wide and 150 feet long per year and would be excavated and reclaimed concurrently. Total excavated area for 281 Gulch over 2-4 years is estimated to be two acres.
- Starting in 2006 the recreation experience would change. Currently, an area along the drainage (200-300 feet) is marked off for digging. Topsoil and overburden are mechanically removed and stockpiled. Visitors choose where to dig through the subsoil for the garnet-bearing gravels and then wash the garnets with screens in place. Administration of the site in this manner would no longer be used. Instead, garnet-bearing gravels would be excavated and stockpiled with equipment. Visitors would then obtain garnet-bearing gravels from the stockpile and wash them at a sluice. Less than one half acre of clearing and excavation would be required for the sluicing operation.
- Beginning in 2006 operations would include using heavy equipment for annual stream channel work and reclamation (for more detail see Design Features in this chapter and Appendix A). Equipment would be needed from one to three times per year. The equipment would remove and separately

stockpile topsoil, overburden and garnet-bearing gravels. Approximately three to nine feet of overburden would be removed to get to the gravels. Excavations would be reclaimed directly following removal of garnet-bearing gravels. This way, the stream would only be disturbed while the gravels are being removed and then the layers would be replaced.

- A sluice would be set up for screening and washing of garnet-bearing gravels. This would be in an upland area out of the wetlands. Water for the sluice operation would be obtained using water withdrawals from 281 Gulch and would be recycled. The system would include settling ponds and sediment-control structures. Sediment would be removed from settling ponds, stockpiled, and then be reused for reclamation.
- Restoration from past operations in 281 Gulch would be completed (See Appendix C). Road 3781, which provides access to the A-frame (0.35 miles), would be decommissioned and recontoured when the public garnet area is closed.
- Upon closing of the garnet area, all facilities would be removed: toilets, A-frame, parking areas.
- The effectiveness of restoration and closure of garnet area would be monitored.
- The floodplain/wetland at existing parking lots on Road 447 (281 Gulch & Pee Wee Gulch) would be partially re-established leaving space for turnouts.
- A total of four culverts would be replaced on Road 447 where it crosses Pee Wee Gulch, No Name Gulch, 281 Gulch, and Garnet Gulch.

Alternative B – Proposed Action

Alternative B was designed specifically to meet the purpose and need described in Chapter 1 based on conditions within the project area. The Forest Service proposes to continue public recreational collecting at the Emerald Creek Garnet Area with new methods of operation to protect water quality and aquatic habitat and provide a safer environment for the public (Appendix A). Operations would continue in 281 Gulch until the accessible garnet gemstone resource is depleted (two to four years). At that time, the Forest Service would move the operations from 281 Gulch to Garnet Gulch, construct a new road to access operations in Garnet Gulch, and construct a trail to connect the existing 281 Gulch parking area on Road 447 with the new road. Previously dug areas in 281 Gulch would be restored to improve aquatic habitat and maintain water quality. This would include placing large woody debris in Pee Wee Gulch and No Name Gulch to diversify aquatic habitats.

With information collected from surveys and exploration during 2002-2006, the Forest Service developed an operations and reclamation plan to address water and aquatic habitat concerns for the remaining area in 281 Gulch and the new collecting area in Garnet Gulch. The proposed action includes the following:

- Rehabilitation for previously dug areas in 281 Gulch would be implemented to improve aquatic habitat and assure maintenance of water quality (FEIS, Appendix C). Large, woody debris would be strategically placed in the stream along an estimated 1,000 feet of both Pee Wee and No Name Gulch to enhance aquatic habitat.
- The public collection site would remain in the East Fork and the main stem of 281 Gulch until the accessible garnet gemstone resource is depleted (estimated to be two to four years). At that time, operations would be moved from 281 Gulch to Garnet Gulch and continue for an estimated twenty years. On the West Fork of 281 Gulch no additional collection sites will be opened up.
- Starting in 2006 the recreation experience will change. In the past an area along the drainage was marked off for digging. Topsoil and overburden were mechanically removed and stockpiled. Visitors chose where to dig through the subsoil for the garnet-bearing gravels and then washed the garnets in place. Administration of the site in this manner will no longer be used. Instead, garnet-bearing gravels will be excavated and stockpiled with equipment. Visitors will then obtain garnet-bearing gravels from the stockpile and wash them at a sluice.

- Beginning in 2006 operations will include using heavy equipment for annual excavation and reclamation. Equipment would be needed from one to three times per year. The equipment would be used to remove and separately stockpile topsoil, overburden, and garnet-bearing gravels. Approximately three to nine feet of overburden would be removed to get to the gravels. Excavations will be reclaimed directly following (within approximately one week) removal of garnet-bearing gravels. This way, the stream will only be disturbed at the time the gravels are removed and then the soil layers will be replaced.
- A sluice will be set up for screening and washing garnet-bearing gravels. This will be in an upland area away from the wetlands. Water for the sluice operation will be obtained with water withdrawals from 281 and Garnet Gulches, will be stored in ponds and then recycled. The system will include settling ponds and sediment-control structures (Appendix H: Map 4). Sediment will be removed from settling ponds, be stockpiled, and be reused for reclamation.
- Newly excavated areas will be an estimated 50-100 feet wide and 150 feet long per year and will be excavated and reclaimed concurrently. Total excavated area (both upland and wetland) for 281 Gulch over two to four years is estimated to be two acres, and the total excavated area for Garnet Gulch over an estimated 20 years would be about 4.2 acres.
- When operations move to Garnet Gulch, a new road (0.68 mile) would be constructed to provide access for administration and people with disabilities. At the end of the road a small parking lot, toilet, administrative building and sluice would be constructed (approximately one acre of clearing). The new road would not accommodate buses and RVs; these vehicles would be parked at the existing 281 Gulch parking lot.
- A trail from the existing 281 Gulch Parking Lot on Road 447 to the new road up Garnet Gulch would be constructed (0.1 mile). This would allow visitors to go directly from the parking lot to the trail without having to walk along heavily traveled Road 447.
- When operations move to Garnet Gulch, most of the public (except disabled) would take the new access trail from the existing 281 Gulch Parking Lot on Road 447 up to the new administrative road and then hike along this road to the collection site. The hike would increase from what is now required to get to the 281 Gulch (0.4 mile) to 0.7 miles to get to Garnet Gulch. Benches for rest stops would be installed along the route. Interpretive signs relating to the ancient Lake Clarkia and geology of the area would also be installed along the trail and road.
- When operations move to Garnet Gulch, the 281 Gulch access road (Road 3781) would be decommissioned and recontoured (0.35 mile or 1774 feet). The administrative building and toilet would be removed.
- A portion (1/2 acre) of the floodplain would be reestablished at the Pee Wee Gulch parking lot while leaving space for a vehicle pull-through.
- A total of four culverts would be replaced on Road 447 where it crosses Pee Wee Gulch, No Name Gulch, 281 Gulch, and Garnet Gulch.

Alternative C

This alternative is the same as Alternative B except it includes making the new road available for everyone (not just people with disabilities and administrative traffic) to drive to the Garnet Gulch collecting site. In the proposed action the new road up Garnet Gulch would be used only to provide access for administration and for people with disabilities. A number of comments from the public and the interdisciplinary team suggested a need to provide access for everyone to the site at Garnet Gulch once operations move from 281 Gulch. There was concern that the proposed hiking route would be too long and difficult for some people, thus excluding them from getting to the site. Road access for everyone would require a larger parking area (three acres of clearing) at the Garnet Gulch site. In addition to action described for Alternative B, Alternative C would also include the following:

- When operations move to Garnet Gulch, a new road (3,610 feet or 0.68 miles) would be constructed up Garnet Gulch for all access except buses and RVs. These larger vehicles would have to be parked at the existing 281 Gulch Parking Lot on Road 447 which would require participants who traveled in these vehicles to hike the 0.66 mile route to the garnet collection site. The new road would end on the ridge above Garnet Gulch where a parking lot, toilet, administrative building and sluice would be constructed (approximately three acres of clearing).
- The 281 Gulch Parking Lot on Road 447 would be maintained for overflow parking and large vehicles, buses and RVs.
- The hike on the trail/road referred to in Alternative B would be used for people having to use the 281 Gulch Parking Lot (buses, RVs and overflow).

Design Features and Mitigation Measures

All alternatives would utilize applicable Best Management Practices identified in relevant provisions of the Surface Mining and Dredge and Placer Operations (State of Idaho Department of Lands – Bureau of Minerals, “Manual of Best Management Practices for the Mining Industry in Idaho, 1992, located at www2.state.id.us/lands/bureau/Minerals/bmp_manual1992/bmp_index.htm). In addition, the following measures (referred to as “performance standards” by the Environmental Protection Agency) would also be adhered to for the action alternatives. Where these features may overlap with the State of Idaho BMPs, these project-specific features would supersede the State of Idaho provisions.

As stated in the previous text, operation methods would change. Providing a garnet-collecting opportunity to the public while maintaining water quality and aquatic habitat is important to the Forest Service. Therefore, adaptive management would be utilized as the sluice operation is implemented. As methods are used and monitored they may be changed to provide better results to protect resources and provide a better experience for the public.

See Appendix A for more details about operating methods, design features, and mitigation measures.

A. General

1. **Adaptive Management:** Adaptive management will be utilized as the new operations are implemented. As methods are used and monitored they may be changed to provide better results for protecting resources and for providing a better experience for the public.
2. Previously dug areas in Pee Wee, No Name and 281 Gulches will not be re-entered for recreational garnet collecting.

B. Air Quality

This project would comply with procedural and substantive requirements of the Clean Air Act, State Implementation Plans and State Smoke Management Plans. Slash burning, if needed, would be conducted only when favorable weather and wind conditions exist.

C. Fish

1. A total of four culverts would be replaced where Road 447 crosses Pee Wee Gulch, No Name Gulch, 281 Gulch, and Garnet Gulch.
2. Channel disturbance in fish-bearing streams would only be done between July 15 and the beginning of autumn rains.
3. Water withdrawals for the sluicing operation would be minimized or discontinued during periods of low flow. See Design Features F.3.d. & e. and N.12.
4. Habitat would be replaced during rehabilitation and reclamation using existing survey data. Large woody debris would be replaced in numbers to mimic natural conditions using survey data (PF: F-3/6).
5. Native tree species would be planted to replace existing trees that are removed for mineral excavation, and wherever possible trees and shrubs that are uprooted will be replanted during reclamation.
6. Fish would be removed and taken downstream from areas where temporary diversion of water in the stream channel is to take place. See Design Feature F.2.e. and Appendix A, p. 3.

D. Hazardous Materials

1. Outside of standard diesel and gasoline fuels and lubricants no hazardous chemicals or materials would be utilized for excavation or processing activities.
2. Refueling and maintenance of construction vehicles and equipment would not occur within floodplains or within 150 feet of live water. Refueling would follow the guidelines for mobile fueling of vehicles and heavy equipment found in Idaho Best Management Practices for Mining and Stormwater Management Guidelines (www.idl.idaho.gov/bureau/Minerals/ bmp_manual1992/bmp_index.htm).
3. If a piece of equipment is found to be leaking or seeping fuel or lubricants the equipment would be immediately taken out of service and corrective measures instituted to correct the problem and prevent a release. Any contaminated soil or materials would be removed from the site and disposed of in an approved sanitary facility designed to dispose of such materials. The garnet area administrative building and all equipment contractors would have spill prevention control and countermeasures kits.
4. During interim shutdown periods or periods of inactivity, all equipment stored on site would be parked away from areas of steep slopes, and gear boxes and fuel tanks would be underlain with absorbent pads.

E. Heritage Resources

An appropriate inventory was conducted for the proposed activities and cultural properties are known to be located within the area of potential effects. The Forest Cultural Resource Specialist made a preliminary determination that the project would have No Adverse Effect to these properties, and the State Historic Preservation Officer concurred with this determination. The Forest Service would contact the archaeologist for the Coeur d'Alene Tribe, per their request (PF: ACE-15) prior to excavations each year. If new cultural resource sites are discovered activities would stop at the garnet collection site, and the find would be reported to the IPNF Cultural Resource Specialist who would inventory the site and develop mitigations to protect the site in consultation with the State Historic Preservation Officer, appropriate Native American tribes and, if necessary, the Advisory Council on Historic Preservation.

F. Minerals (See Appendix A for extensive details and drawings)

1. General

a. Operations and reclamation would follow Best Management Practices recommended by the State of Idaho that are relevant to this project (www2.state.id.us/lands/bureau/Minerals/bmp_manual1992/bmp_index.htm on 1/12/06).

b. Total disturbance over the life of the project is estimated to be 12-14 acres (this includes all roads, stockpiles, excavation, parking areas in 281 Gulch and Garnet Gulch, sluice areas and ponds) for up to approximately 24 years.

2. Excavations and Reclamation

a. Each year in the fall (dry season) after the garnet area is closed for the season, an area (mining panel(s)) would be excavated and garnet gravels would be removed and stockpiled for use in the following year. The excavated area would be reclaimed as soon as excavation work is complete which is estimated to be within one week.

b. Auger testing for gemstone garnet would be implemented in order to facilitate engineering planning for annual excavations.

c. If required, a small interceptor trench would be constructed to divert surface or groundwater flow around the excavation site. The trenches would be armored with woody debris, straw bales, baffles, or other materials if necessary. Water would be diverted to a water containment/recycle system located at the lower end of the panel and would be moved to the sluice plant as make-up water or be sprinkled overland. There would be no direct discharge to streams.

d. Prior to excavation activities, vegetation would be cleared. Slash would likely be bundled and placed between the excavation area and the active channel. Logs and additional slash would be stockpiled for use during reclamation as needed.

e. In cases where the panel would include excavation immediately adjacent to or through stream channels, a culvert-like diversion or plastic-lined temporary water diversion channel would be used (See N. 8). The diversion would be routed around the excavation site. Fish would be removed from this section using block nets and would be taken downstream prior to water diversion.

f. For each panel, excavations would not be started until water control features are established and determined to be functional.

g. In riparian areas, excavations would start on the upper end of each mining panel and progress sequentially downstream. Excavators (track hoe), not bulldozers, would be used for excavations in wetlands.

h. The size of panels would vary depending on depth of garnet gravels. Estimated size would be approximately 50 -100 feet by 150 feet. The goal is to have a garnet gravel stockpile that is of sufficient size for a season of public garnet collecting. This is estimated to be 545 cubic yards (See Minerals section in FEIS Chapter 3).

i. The panels would consist of a series of cuts by an excavator down to the base of garnet-bearing gravels, typically down to bedrock. Each panel would be excavated in a series of sequential cuts from top to bottom then be backfilled. A typical cut would be 8-10 feet wide. Disturbance would be kept to the smallest practicable area at any one time during excavations through concurrent and progressive backfilling, grading and revegetation.

j. Within each cut, the topsoil would be separated and set to the side, then subsoil would be separated and stockpiled to one side. Plywood or other material may be used under the stockpile to protect the underlying topsoil and aid in recovery of stockpiled materials (PF: PD-33). The garnet-bearing gravels would be removed using a tracked or wheeled loader or a portable conveyor system and then would be taken to the garnet gravel stockpile.

k. As soon as the garnet gravel is removed, the cut would be back-filled and reclaimed using spoils collected and stockpiled from the previous season's flume wash. Backfilling with these materials will ensure volumetric balances and original stream gradients are restored to their pre-mining conditions.

l. Subsoil and topsoil from the current excavation would then be returned to the site. Care would be taken to maintain the vegetative mat when feasible while excavating and storing the topsoil. The immediate backfilling and reclaiming ensures that the mining panel will only be open for a short period of time (estimated to be one week).

m. Reclaimed areas would be planted with native shrub and tree species and be seeded and mulched. Where possible uprooted shrubs and trees would be replanted.

3. Flume Wash (Sluice)

a. A flume wash plant will be set up for the public to wash and recover garnets. This will consist of pump, water holding pond(s), flume, riprap-lined spillway, settling and recycling pond(s). It will be located out of the floodplain, in the upland area, and near the garnet gravel stockpile.

b. A flume (a long-linear, shallow-sloped, flat-bottomed trough) will be set up for washing garnet gravels. Running water will be pumped (from the settling pond below) or be gravity-fed into the upper end of the flume. The silt, sand and fine gravel mix will be screened to recover the garnets. The flume will be approximately 18 inches by 10 inches deep and will be constructed in short sections with enough length to accommodate up to 30 visitors at one time.

c. The sediment-laden wash water will be fed down the flume, then through a rock-lined raceway back into the settling-recycling pond system. The settling ponds will be designed to settle clay, silt and sand and then allow the waste water to be re-cycled. For spoils management, another smaller pond may be utilized to catch and settle coarser-grained materials. The settling ponds will be periodically excavated, and the spoils will be stockpiled for use during reclamation (see above under reclamation operations).

d. Water is needed to operate the flume wash plant (sluice). An estimated 100-200 gallons per minute will be needed. The Forest Service has acquired water rights to 281 Gulch and Garnet Gulch at the rate of 0.5 to 1.0 cubic foot per second (from 3.7 to 7.5 gallons per second). Prior to the summer season during high flows, water will be taken from a withdrawal point in the upper end of the gulch to the pond system at the flume wash site. The pond system will be filled slowly using a flexible hose or rigid pipe outfitted with a small diameter screen to prevent inadvertent entrapment of fish or small aquatic invertebrates. A pump system will then pump water from the pond system into the flume/sluice.

e. It is anticipated that during the driest part of the annual season there may be a need to store additional water to make up for increased evaporation and to minimize water withdrawals. A water make-up pond (an excavated depression or other above-ground storage system typically used to collect or store additional water) will be used for water storage if needed. Additionally, a water truck may be used to supplement if needed (See N.12).

G. Noxious Weeds

A number of preventative and control measures will be taken to reduce the risk of noxious weed introduction and spread in accordance with the St. Joe Weed EIS (ROD, 10/12/99). Measures include:

1. All ground disturbance related to earth-moving activities will include mulching and reseeding as soon as practical after completion of ground-disturbing activity to minimize infestations.
2. Mulching agents such as hay or straw will be certified noxious weed-free before they are allowed on the project area.
3. All seed used for re-vegetation and erosion control purposes will be certified noxious weed-free. Native vegetation from the site will be used as much as possible. This includes trees, shrubs, and forbs.
4. A mix of species will also be used in rehabilitation of sites. Non-native annual grasses may be used in rehabilitation efforts. Some of these species are valuable for revegetating sites quickly to avoid erosion.
5. The timing of reseeding will normally be immediately after excavation operations are complete.

6. Off-road construction and mining equipment will be cleaned and inspected prior to entering the project area to remove dirt, plant parts, and material that may carry weed seeds. A provision will be included in the contract.
7. Sites where ground-disturbing activities are planned will be evaluated for existing infestations and treated if necessary prior to initiation of ground-disturbing activities.
8. If new populations of noxious weeds are found, treatment will be implemented in accordance with priorities set by the noxious weed program. New invader species will be slated for eradication immediately upon discovery. Other weed infestations will be treated according to the direction in the St. Joe Noxious Weed Project EIS and district priorities.

H. Rare Plants

1. The five lower-most panels (450 feet) that were proposed for mining in Garnet Gulch were eliminated from consideration for excavation because this area has the most extensive and healthy populations of naked mnium in the project area. All ground-disturbing activities will be confined to the panels above this point.
2. If previously undiscovered Threatened, Endangered, or Sensitive plant species are found project activities at that site would cease until an assessment and recommendation is made by the District Botanist. Measures to protect population viability and habitat for all known and newly discovered occurrences would include the following: altering or dropping activity, modifying the proposed activity and implementing buffers around plant occurrences.
3. If water is pumped from excavated areas and is applied over land, it would only be applied on relatively flat, well-vegetated areas. One potential site for this application is within the occupied habitat of *Rhizomnium nudum* (below the lowest panels on Garnet Gulch). If this site is used, the water application would only be deposited on the eastern bank of Garnet Gulch. The eastern bank has the least number of these plants. See N.11.
4. Restoration plans in 281 Gulch will be designed to avoid the naked mnium sites.
5. Any changes to the proposed extent of restoration activities in the West Fork of No Name Gulch would be reviewed by the District Botanist to ensure protection of rare plant sites located there.

I. Range

1. Adaptive management will be applied to address cattle use in the project area in order to prevent resource damage. Forest Service employees will immediately notify the permittee of cattle presence in the current garnet collection site. The permittee will then be responsible for promptly removing their cattle. If such measures do not prove successful in eliminating resource damage from cattle, other options will be pursued.
2. A cattle guard would be installed at the junction of Road 447 and the new Garnet Gulch Road to prevent cattle from entering the Garnet Gulch Drainage.

J. Recreation

1. Improvements needed to establish the new operations would be constructed to maintain a rustic and natural experience as much as possible.
2. A 600-foot access trail would be constructed from the 281 Gulch parking lot to the Garnet Gulch access road. This trail would be for foot traffic only and would be built according to Forest Service specifications.
3. Benches for rest stops would be installed along the new trail and road. Interpretive signs relating to the ancient Lake Clarkia and the geology of the area would also be installed along the trail and road.
4. Informational materials would explain access restrictions and accommodations for getting to the garnet area administrative site for people who are unable to walk there. People with “disabled” designation in their vehicles will be allowed to drive to the administrative site.

K. Roads

1. The State of Idaho Best Management Practices Manual will be followed in locating, constructing, operating and reclaiming mineral access roads with the objective of minimum resource damage (www2.state.id.us/lands/bureau/Minerals/bmp_manual1992/bmp_index.htm on 1/12/06).
2. The new road proposed in Garnet Gulch would be designed to minimum standards (14 feet wide plus curve and fill widening with turnouts) to accommodate maintenance equipment. Portions of this road would be graveled to maintain a stable base and minimize sediment yield.
3. Large equipment would be unloaded at the 281 Gulch parking area and be driven to the site.
4. The proposed Garnet Gulch road location, alignment, width, grades, and drainage were reviewed by a qualified engineer (PF: T-3); and designs would be utilized to minimize risks from unstable soils and slopes, surface water damage, and groundwater seepage.
5. The intersection of the proposed Garnet Gulch road with the existing road (Rd 447) runs through relatively steep ground. Some buttressing of the cut slopes would be designed as needed for slope stability and erosion control (PF: T-3).
6. For the proposed Garnet Gulch road, no fill material would be placed on the old inactive headwall located 500 feet past the top of the cut of the existing road. Full bench construction would be necessary (PF: T-3).
7. When the public collecting site at 281 Gulch is closed, the 0.35-mile access road (Road 3781) will be recontoured to the extent practicable to the original slope and be revegetated with species (grasses, forbs, shrubs, and/or trees) suitable for the site.
8. A gate and cattle guard would be installed at the beginning of the proposed road for Garnet Gulch at the junction with Road 447.
9. To sustain truck traffic during East Fork 281 Gulch restoration activities, portions of Road 3781 may be graveled to maintain a stable base and minimize sediment yield.
10. During restoration and excavation activities dust abatement will be applied to project roads as needed to minimize dust.

L. Safety

1. All operations will be conducted in a safe manner and in compliance with Mine Safety and Health Administration (MSHA), Occupational Safety and Health Administration (OSHA) and other applicable local, state and federal requirements and guidelines.
2. The road construction contract for Garnet Gulch would include appropriate public safety plans.

M. Scenic Resources

1. A rustic gateway would be installed at the beginning of the proposed road to Garnet Gulch instead of a brightly colored steel gate that is often used.
2. Prompt revegetation of the fill slopes for the proposed new road to Garnet Gulch would be implemented. If buttressing is used for the first sight distance (250 feet) of the proposed road, rock obtained from the immediate area (local rock with same coloring) would be used as much as possible.

N. Soils and Watershed

1. Structures would be located outside of the riparian areas and flood plains.
2. Auger test holes used for establishing the annual excavated area will be filled immediately.
3. All areas that are disturbed by gemstone extraction will be reclaimed concurrently with the excavation.

4. Topsoil and overburden will be excavated in soil layers and will be stockpiled to return the site to as near the pre-existing condition as possible. Returning topsoil and overburden to the excavated site will be implemented immediately upon removing the garnet gravel layer. It is estimated the excavated site will be open for one week. This concurrent reclamation (progressive backfilling, grading and backfilling) will reduce the amount of material exposed at any given time and will reduce the possibility of sedimentation.
5. If equipment is operated on areas that would not be excavated otherwise, one or a combination of the following methods would be used to minimize compaction of soils: minimum size and weight equipment, low ground pressure tracked vehicles (defined by contact pressures in the range from 5 to 10 psi), long-arm excavator, and/or construction mats or other suitable methods.
6. In areas where soils become compacted due to construction equipment, soils may be decompacted if needed.
7. Where disturbance to the stream channel occurs, reclamation would have a designed channel and would incorporate large woody material, boulders, sedges, shrubs and trees.
8. Whenever possible, excavating will be scheduled for low-flow periods. Normal surface water flows will be conveyed past the work area by means of bypass channels, pipes, pumps, plastic linings or cofferdams.
9. During periods of high precipitation or runoff, earth-disturbing operations would be curtailed to prevent excessive erosion and sedimentation.
10. Diversion trenches, dewatering wells, grout curtains, coffer dams, slurry walls, geomembrane barriers and/or steel sheet piles may be used if needed to minimize groundwater seepage into active excavation cuts. These control features can effectively lower the groundwater table so that it will not go into excavation areas (National Seal Company, 1991; Cavalli, 1992; and Sherman, 1992).
11. If it is necessary to pump water from excavated areas, the water would be used in the sluicing system or stored for later use or be applied over land. For overland application the water would be dripped or sprinkled onto relatively flat, well-vegetated areas. If it is necessary to dispose of water in this manner in the occupied habitat of *Rhizomnium nudum* below the lowest panels on Garnet Gulch, it would only be deposited on the eastern bank of Garnet Gulch.
12. Water removal from 281 Gulch and Garnet Gulch for the sluicing operation would be limited to the amount necessary to initially fill the settling pond and the recycling or storage pond system and then to augment losses due to spillage, subsurface seepage, groundwater recharge and evaporation. Removal would be timed so that the initial filling occurs in the spring when flows are high. Periodically, when water becomes too low for effective sluicing due to losses from evaporation, spillage, and percolation, the system will be recharged with water from the stream source pending review by District Fish Biologist and District Hydrologist. During drier periods, only a small portion of the stream flow over an extended time period will be removed for augmentation. No digging or filling to accommodate water withdrawals is anticipated. Additionally, a water truck may be used to supplement if needed.
13. Areas that are disturbed would be revegetated. Replanting and reseeding, if needed, will be conducted with approved seed and stock and would consist of planting densities and species appropriate to the site.
14. Sediment basins or settling ponds will be installed to collect sediment generated from the gemstone washing. The sediment will be removed from settling basins and will be stockpiled as far from the active channel as practicable until it is used for reclamation.
15. Disturbed sites will be covered using mulch, seed, slash, or erosion blanket while vegetation becomes established.
16. Erosion control structures will be utilized to prevent excessive run-off and erosion. Structures will be constructed in accordance with the Idaho Department of Environmental Quality Catalog of Stormwater Best Management Practices for Idaho Cities and Counties, 2nd Edition, April 2001, the

U.S. Environmental Protection Agency's Storm Water Management of Construction Activities; Developing Pollution Prevention Plans and Best Management Practices, September 1992; and the Idaho Department Best Management Practices for Mining in Idaho, November 1992. Erosion control systems will be established as appropriate for the site. Specific design features will include implementation of the following practices:

a. Sediment control devices will be installed prior to surface-disturbing activity, be inspected regularly, and be cleaned to maintain at least 60 percent of their sediment-holding capacity. Site specific BMPs will be utilized where necessary to insure there will be no net increase in sediment yield from the site.

b. Sediment control methods may include barriers, silt fences, slash filter windrows, rolling dips, graveling, scattered slash, mulching and seeding, or other methods deemed appropriate for the site. Sediment traps and barrier systems will be inspected periodically and as needed during periods of inclement weather. Accumulated sediment will be periodically removed, possibly stockpiled and then be used in reclamation as needed.

c. Temporary access trails for equipment (e.g. to establish the garnet gravel stockpile) may be constructed with rolling dips and be armored with rock if needed and be reclaimed.

d. Where possible, site design features will promote diffuse flow or runoff over the ground surface to prevent concentrated flow.

e. Temporary diversion of stream channels or alteration of channels or stream banks during operations will be kept to the minimum practical.

f. Sediment traps and sediment control devices for surface drainage will be maintained until disturbed areas are restored and revegetation requirements are met.

17. A channel would be reconstructed on the surface of the excavated panel that mimics the pre-disturbed existing channel in both size and shape (unless an alternative design is agreed to for habitat improvement). Valley and stream channel cross-sections and stream longitudinal profile survey data (PF: SW-4, SW-24, SW-26) collected in 2002-2005 would be used to configure and locate the reconstructed channel. The streambanks would be stabilized using wraps of coir fabric or other biodegradable geo-textile. One or two wraps of the fabric would be used depending on existing channel depth, each lift about 12 inches (FEIS, Figure 18). Fabric or geo-textile and perhaps up to eight inches of gravel may be placed in the reconstructed stream bottom. Also logs and/or large cobbles to small boulders may be used for bank material to provide aquatic habitat and stream bank and channel stability. The reconstructed channels will be monitored for stability and stream bank vegetative cover (FEIS, Appendix C).

O. Tree Clearing and Slash Handling

Trees will be cut only to the extent necessary for the operations. Associated slash and large wood will be used for reclamation as needed.

P. Wildlife

1. Riparian disturbance will be kept to the smallest area practicable in any one year of operation.
2. During reclamation, the topography will be returned to its previous slope and elevation. The existing amount of persistent pooled water (for amphibian habitat) will be maintained or increased.

Monitoring

Monitoring will be conducted on a sample basis and will be designed to verify that projects are implemented as designed, are effective and most efficient in meeting the project and Forest Plan objectives, and also to determine whether the project and Forest Plan goals and objectives for the area are still appropriate.

Forest Plan Monitoring

The Idaho Panhandle National Forests developed a plan to monitor implementation and effectiveness of management practices implemented under the Forest Plan and to validate the assumptions and models used in planning. The Forest prepares a Forest Plan Monitoring and Evaluation Report on an annual basis to document the results of this monitoring.

Forest-level monitoring may or may not take place specifically on this project, but information gathered and lessons learned at the broader level are applied back to specific project-level design, implementation, and monitoring. Forest Plan monitoring for the St. Joe Ranger District which address issues pertinent to the Emerald Creek Garnet Area include:

- Heritage Resources: Field monitoring is done by the Forest Service Archeologists to measure potential effects of land-disturbing projects on known cultural resources. Areas are surveyed prior to project implementation, and site specific plans are developed to protect newly identified sites.
- Threatened, Endangered, and Sensitive Plants: IPNF direction is to inventory and manage sensitive plants so that no new species have to be listed as threatened or endangered. Project areas are surveyed and projects are modified before ground-disturbing activities begin to attain this objective. Sensitive plants are protected according to site-specific management plans.
- Soils: IPNF objective is that management activities on Forest lands will not significantly impair the long-term productivity of the soil or produce unacceptable levels of sedimentation resulting from soil erosion. This is accomplished using technical guides developed in conjunction with the soil survey and Best Management Practices necessary to protect soil productivity and minimize erosion.
- Visual Quality: Decision documents are reviewed annually for Forest Plan visual quality objective compliance. Annually, up to two areas per district may be field reviewed after project completion. The objective of the field review is to determine if the Visual Quality Objectives (VQOs) were met as disclosed by the decision document for that project. A ten percent departure from Forest Plan direction after five years would initiate further evaluation of the visual resource management program.
- Water Quality: Forest Plan Appendix JJ established the IPNF water quality monitoring program. According to Appendix JJ of the Forest Plan, in order to demonstrate water quality protection, monitoring plans address three primary questions:
    - Are BMPs implemented as designed?
    - Are the BMPs effective in controlling non-point sources of pollution?
    - Are beneficial uses of water protected?

  To provide answers to these questions, the Forest Service uses the following monitoring categories:
    - Baseline monitoring characterizes existing water quality conditions and long-term trends of stream systems. It also provides a control for monitoring and assessing activities. Baseline monitoring sites throughout the Forest have been identified and established to representatively sample conditions on the Forest.
    - Implementation monitoring shows whether or not prescribed BMPs were implemented as designed and in accordance with Forest Plan and project standards and guidelines. In addition to specific project monitoring discussed in this document, supplemental implementation monitoring includes internal field reviews by interdisciplinary teams using a procedure similar to State audits.
    - Effectiveness monitoring demonstrates if BMPs were effective in controlling pollutants to meet planned levels or resource management objectives. The intent is to focus on cause and effect relationships between land management activities and water quality. Effectiveness monitoring is done on a sample basis to characterize typical conditions so that results can be extrapolated. Emphasis is on major non-point pollution source contributing activities such as road construction, reconstruction, and maintenance; related erosion control BMPs; and riparian area management.

In the event of incorrect or inappropriate application of BMPs, or omission of prescribed BMPs, causes are identified along with corrective or preventive actions to be taken. Corrective measures are incorporated into: 1) modification of and adjustment to contracts; 2) administrative procedures; and 3) long-range plans as necessary to ensure BMPs are both properly designed and implemented.

- Wildlife: Big game management indicator species population trends are determined by the Idaho Department of Fish and Game. Hunter success rates and visual counts of animals are used to determine these population levels.

  Elk Habitat Potentials are monitored by ranger district and by individual Elk Habitat Unit annually.

  Northern goshawk nesting sites are monitored by ranger districts. Known nesting sites are visually inspected to determine occupancy. The monitoring frequency varies based on funding. Surveys are conducted for additional nesting sites during project planning or implementation if nests are sighted.

Project Monitoring

(See FEIS Appendix C for more detail)

In addition to Forest Plan monitoring, project-specific monitoring will be conducted to ensure that implementation is consistent with the established standards and guidelines. Monitoring will also be conducted to determine the effectiveness of management activities and applied mitigation measures. Adaptive management will be utilized as the new operation is implemented. As methods are used and monitored they may be changed to provide better results to protect resources and provide a better experience for the public. Restoration of previously dug areas in 281 Gulch will be monitored according to the plans described in Appendix C of the FEIS. These same monitoring methods will be used in Garnet Gulch when operations are moved there. Specific monitoring developed for the project includes:

Baseline Data: Stream surveys conducted in the project area established a baseline for monitoring turbidity and stream flow. Sediment monitoring was conducted during 2001-2004 and turbidity was monitored in 2004-5 during operating seasons. Stream flow was estimated in 2002-3 based on measurements at the East Fork Emerald Creek gauging station and using area-discharge relationship and also measured for 281 Gulch. Garnet Gulch stream flow was measured in 2004 and 2006. Additional surveys measuring channel and valley cross sections and longitudinal profiles are also on file. Fisheries surveys established baseline information for water temperature and residual pools. The reference area in Garnet Gulch for vegetative cover will be surveyed in summer 2007. Western toad surveys confirmed the presence of the western boreal toad in 281 Gulch.

Implementation Monitoring: Project implementation generally involves the efforts of a variety of individuals with both specialized and general skills and training. Employees on the St. Joe District are accustomed to working together to achieve the desired project objectives. For example, the minerals administrator works with biologists or other specialist to ensure that mining operations and reclamation are implemented properly. At the recreational collecting site, the recreation specialist continually works with the geologists, hydrologist and biologists to ensure that the ongoing operations and end reclamation product is as planned. Joint field reviews are done as needed. These steady informal communications allow for incremental project adjustment throughout implementation to achieve the desired results. In addition to these less formal monitoring procedures, the following monitoring items will be conducted.

- Heritage Resources: All employees working at the Emerald Creek Garnet Area are required to promptly notify the Forest Archeologist upon discovery of a previously unidentified heritage resource. Work in that area will be halted until an assessment and protection measures are conducted. See Design Feature E for more detail.
- Channel Morphology: Measurements of channel and valley cross sections and longitudinal profiles taken prior to excavation will be used to re-establish channels in the excavated areas. The proposed reconstructed channels will be monitored for stability and stream bank vegetative cover (FEIS Appendix C).

- Minerals / Recreation: Daily garnet weights per person per day will be recorded to assess garnet removal. Comment forms will also be available to assess whether we are meeting the public's expectations.
- Sensitive Plants: Some water disposal may take place on *Rhizomnium nudum* sites on the eastern side of Garnet Gulch. It is not known what effect this will have on this moss. Annual monitoring will be conducted to determine if water disposal has detrimental effects to the population of *R. nudum*. If declines in the population are recorded, then alternate water disposal sites or methods will be employed.
- Range: Cattle use in the Emerald Creek Garnet Area will be reported to the permittee immediately. The permittee will then be responsible for promptly removing the cattle. Temporary electric fencing may be used on the recently reclaimed areas if needed.
- Safety: All operations will be conducted in a safe manner and in compliance with Mine Safety and Health Administration (MSHA), Occupational Safety and Health Administration (OSHA), and other applicable local, state and federal requirements and guidelines. If operations are found to be out of compliance with these regulations and the failure to comply presents a significant risk to the health, welfare or safety of the general public, operations will be terminated until corrective measures are implemented.
- Restoration: Restoration monitoring will be done according to the monitoring plan developed for the restoration work in 281 Gulch (FEIS, Appendix C).
- Water Quality: Water quality will be monitored to ensure compliance with IDAPA 58.01.02 (See Design Feature N.16., Erosion Control Plan in Appendix A and Appendix C). See effectiveness monitoring below.

Effectiveness Monitoring

- Water Quality: On-site monitoring will be conducted in a variety of ways. Visual inspections of sediment basins, operations and past rehabilitation will be conducted daily during operations and at a minimum once during mid-winter and once in early spring (see PF: SW-66 for list of previous site visits). Daily turbidity measurements will continue during operations both above and below newly reclaimed areas and at the sluice plant site. Automated sediment samplers will be installed in East Fork Emerald Creek above Garnet Gulch, between Garnet Gulch and 281 Gulch, and below 281 Gulch.
- Noxious Weeds: Forest Service employees monitor the garnet collection areas for new populations of noxious weeds. Areas where ground-disturbing activities occur would be inspected at least yearly for new populations of noxious weeds. Should new populations be found, treatment would be implemented in accordance with priorities set by the noxious weed program (Design Feature G.8.).
- Vegetative Success: In the first year following revegetation efforts there would be 100% ground cover consisting of a combination of vegetation and mulch. Reclaimed areas would be monitored until a minimum of 75% vegetative cover of that found within a reference area was established, ideally within three years. A minimum of 50% of all planted shrubs or trees would be maintained. Supplemental seeding and/or planting would occur as necessary to meet goals.
- Wetland Success: Observe continual increase in cover percentage, plant species diversity, size and age class during the monitoring period and allow natural recruitment of desirable wetland species to be included as cover and as species diversity during long-term monitoring. Monitor for soil redoximorphic (anaerobic) conditions annually during the monitoring period or determine hydrophytic vegetative recovery as indicative of hydrologic recovery.
- Wetlands / Wildlife: Follow-up surveys for persistent pooled water and western boreal toad would be conducted on an annual basis (Appendix C Monitoring Plan).

Alternatives Considered But Eliminated from Detailed Study

Section 102(2)(e) of the National Environmental Policy Act (NEPA) states that all federal agencies shall "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources." An environmental assessment must also "rigorously explore and objectively evaluate all reasonable alternatives" [40 CFR 1502.14(a)].

The courts have established that this direction does not mean every conceivable alternative must be considered, but that selection and discussion of alternatives must permit a reasoned choice and foster informed decision making and informed public participation.

The range of alternatives presented in this chapter was determined by evaluating public and internal comments and the purpose and need for the project. Other influences included Forest Plan goals, objectives, desired future condition, standards and guidelines; federal laws, regulations, and policies. Within these parameters, the alternatives developed by the interdisciplinary team display a reasonable range of outputs, management requirements, mitigation measures, and effects on resources. In addition to the alternatives considered in detail, the interdisciplinary team examined a number of other alternatives during the analysis process. Although these alternatives contributed to the reasonable range, they were eliminated from further consideration for the reasons listed below.

Maintain the Current Recreational Experience

Because of the need for public safety, protection of water quality and aquatic habitat, and more complete garnet recovery the proposed action would change the recreation experience for garnet area visitors. Currently, an area along the drainage (200-300 feet) is cleared of vegetation and is marked off for digging. The stream is routed through an irrigation pipe to bypass the digging area and straw bale sediment dams are installed making settling ponds for garnet washing. Topsoil and some overburden are mechanically removed and stockpiled. Garnet area visitors then choose where to dig through the subsoil for the garnet-bearing gravels and wash the garnets with screens in a settling pond. The result is that the area along the stream remains excavated for the operating season which is Memorial Day through Labor Day. With the proposed alternatives, administration of the site in this manner would no longer be employed. Instead, garnet-bearing gravels would be excavated and stockpiled with equipment (e.g. an excavator) and the area would be concurrently reclaimed. The operation would require up to one week. Visitors would not be digging to find the garnets; they would use a bucket to collect garnet-bearing gravels from the stockpile and then wash them at a sluice. Thus the recreational experience would be less vigorous and very different from the experience in the past.

Approximately 17 percent of the 93 comments received indicated that they were opposed to the new methods and that they preferred the original method of hand digging the garnets in place. The following comments portray how these people feel:

- "sifting through pre-collected materials has all of the appeal of fishing in a wading pond"
- "thrill of digging…makes it an authentic experience"
- "digging in the mud and muck is ¾ of the fun"
- "preferred digging for stones in their natural locations"
- "would demoralize the authentic experience of actually hand-digging the garnets"
- "would greatly reduce the sense of joy and satisfaction of finding a gemstone…sifting through pre-dug material would be equivalent of going to Wal-Mart and digging in a pile of dirt"
- "reminds of some cheap sleazy roadside attraction"

Another twenty-four percent of the respondents indicated some question or doubt about the proposed new methods. Twenty-five percent of the respondents liked the proposed new methods and thirty-four percent had no comments either way at this time.

Continuing the present operation was eliminated from further study because of the difficulty in ensuring public safety, water quality and aquatic habitat and the resulting incomplete garnet recovery. As discussed earlier in this document, the star garnets are generally in riparian areas and there are issues regarding protecting water quality and aquatic habitat. In addition, public safety is very important and this is more difficult to manage with people using shovels, digging holes, and flinging dirt.

Random hand digging of the garnets also results in an incomplete recovery of the garnet resource; often people dump the subsoil from their holes onto another site that may never get dug. The result is that the recovery of the garnets is random and not complete. The new proposed method is a systematic method of removing entire "panels". This process would enable us to completely remove all of the garnet gemstone resource; thus the garnet resource would likely last longer for future garnet collectors. With more complete removal of garnets, less area would be disturbed for the same amount of garnet extraction. With current methods, water management and public safety management are much more problematic. Erosion prevention measures would also be more costly with the current operation than with measures required by the proposed alternatives. As noted above, new operations methods require that the excavated area only stay open up to a week rather than the full season. This would help protect water quality and aquatic habitat.

Immediate Closure of the Garnet Area

Immediate closure of the garnet area was considered, but it was eliminated from detailed analysis because it would not meet the purpose and need. The purpose of this project is to continue to provide a public recreational area for collecting gem-quality star garnets while providing public safety and protecting water quality and aquatic habitats. The garnet area has had strong public support for a long time, and the Forest Service intends to continue to provide safe opportunities for public gem-stone garnet collecting in a manner that will also protect water quality and aquatic habitats. The Forest Service has never received comments from the public or other agencies that indicate we should close the garnet area. On the contrary, public scoping indicates strong public support for the area. It is known internationally, and it is visited by people from all over the United States and from many places around the world. This alternative would not give us time to notify the public, and they would not get a chance to visit the area before it is no longer available.

This alternative would not allow the Forest Service to completely recover the garnets in 281 Gulch, and therefore we would not decommission Road 3781 knowing that we may need the road sometime in the future for garnet recovery. This alternative would not allow the complete restoration of 281 Gulch if the road and administrative area were left intact.

No Mining in Floodplains

An alternative with excavations outside of floodplains only was considered because placer deposits containing garnet gemstones do exist outside of the floodplains in the upland terraces. Floodplains include both riparian areas and wetlands (see Appendix H: Map 5). Extensive site-specific sampling and analysis was conducted in the past three years to evaluate this alternative. This alternative does not meet the purpose and need for reasons described below.

To investigate whether an upland-only alternative is consistent with the purpose and need and with the goals of Section 404 of the Clean Water Act and pertinent executive orders the following factors are considered:

1. Recovery of gem-bearing gravels can only occur if there is sufficient volume, spatial extent and continuity of the deposits to warrant the capital expenditures and agency efforts to develop the deposits and to provide for the public's need for the gem resource over a reasonably long time frame;
2. The garnets recovered in any operation must be of sufficient quantity to satisfy the public demand and be of sufficient quality to warrant them being considered gems by the public collectors;
3. The deposits must be situated in locations and topographic settings where gems can be recovered with reasonable environmental impacts and provide for public safety;

An analysis was completed to contrast the relative quantity, quality and recoverability of garnets from wetland and upland sites in the two drainages selected for future operations. The results of this evaluation, shown graphically in **Figures 1 through 7** (these figures are located at the end of this section), indicate the necessity for wetland operations to meet the project's Purpose and Need as set forth in Chapter 1.

Garnets recovered from test pits throughout the study area were examined by a qualified professional geologist with a high-powered microscope, and the quantity and quality of recovered stones from the respective wetland and upland sample sites compared. Sampling transects were used across both wetlands and uplands (Appendix H: Map 5 and project file maps & figures). Sample sites were selected based on topographic, slope and geologic parameters and done in accordance with accepted industry standards. For 281 Gulch, Three traverses were analyzed starting in the north and finishing in the south. For Garnet Gulch, one traverse was analyzed through the central part of the drainage deposits. The photographs in **Figure 1** are of the garnets recovered from test pit sites along the four traverses discussed above.

Figure 2 shows the size of the largest recovered gem-quality stone (specimen-grade, facet-grade or tumble rough) from each test site. These graphs clearly show the relative decrease in largest recovered gem stones as the sample sites get progressively higher out of the floodplains and on to the upland terrace surfaces. For example, on Transect #4 in Garnet Gulch, the largest gemstone recovered from the wetland sample site within the floodplain (collected from test pit GG-03-8) was a stone 4.05 cm in diameter, whereas the largest gemstone recovered from the sample test site 110 feet laterally upslope (test pit GG-04-15) was only 1.12 cm in diameter. Samples from the next trench higher up the terrace (test pit GG-04-16) were completely cemented and weathered and no gems were recovered. Sampling bias is considered unlikely since large bulk samples were collected from all the sample sites utilizing internally consistent sampling and analytical protocols. The differences in grain sizes are interpreted to reflect the primary depositional environmental controls on the garnet placers. Typically in placer deposits, the denser minerals get sorted and concentrated in the valley bottoms whereas smaller and less dense materials entrained during flood events and seasonal overbank events tend to accumulate in the terraces.

Figure 3 graphs out the relative percentage of gem-quality stones recovered from the total number of stones in a given sample. These graphs demonstrate that a higher percentage of gemstones relative to the total number of garnets recovered are present in the floodplain deposits versus the upland terrace deposits. For example, on Transect #4 in Garnet Gulch, 45% of all the stones recovered from the wetland sample site (test pit GG-03-8) were gem-quality, whereas only 12% of the total number of stones recovered from a sample test site 110 feet laterally upslope (test pit GG-04-15) were gem quality. Samples from the next trench higher up the terrace (test pit GG-04-16) were completely cemented and weathered and no gems were recovered. The implications of this are that longer washing times and greater volumes of gravels must be washed to recover a given quantity of gems from upland deposits than from wetland deposits.

Again sampling bias is considered unlikely since rather large samples were collected with a consistent sampling protocol from all the sample sites. The differences are interpreted to reflect the primary depositional environmental controls on the garnet placers where denser minerals get sorted and concentrated and typically trap in the valley bottoms while smaller and less dense materials concentrate in the overbank deposits and terraces. In addition, field and microscopic observations consistently have indicated that stones recovered from the terrace deposits tend to be significantly more weathered and are frequently cemented due to precipitation of secondary iron- manganese- and titanium-oxides. The greater weathering effects tend to enhance the development of fractures along natural zones of weakness within the individual garnet crystals making them more susceptible to breakage during freeze-thaw cycles which makes cutting and polishing more difficult or impossible. In a number of cases, including all the garnets recovered in the uppermost sample site on Traverse #4 (test pit GG-04-16), individual garnets were so weathered and friable that they could be crumbled in the sampler's hands. The secondary cementation also is detrimental to cutting and polishing and in a number of cases the cementation has been so severe that the garnets could not be recovered. Both the heavy secondary cementation and extensive weathering effects seen in garnets recovered from the upland terrace deposits are thought to be the result of the periodic and seasonal influx of oxygenated rain water and snow melt infiltrating through the relatively permeable garnet-bearing gravel units in the soil subsurface essentially "rusting" the iron-rich almandine garnets in place. The deposits in the floodplains, which remain saturated, mostly under reducing conditions throughout the entire year limit these "rusting" effects and thus the stones are higher quality and have higher preservation potential.

Figure 4 shows the average grade of gravels along transects reported in pounds (lbs) of garnet (greater than 3/8-inch in diameter) recovered per bulk cubic yard (bcy). Although less clear than the previous graphs, it is again evident that the floodplain deposits have higher garnet grades than the upland terraces. For example, on Transect #4 in Garnet Gulch, the grade of the gravels sampled from the wetland sample site (collected from test pit GG-03-8) averaged 7.29 lbs/bcy whereas the average grade of sample collected from

a sample test site 110 feet laterally upslope (collected from test pit GG-04-15) was only 2.28 lbs/bcy. The grade differences probably represent both the primary depositional controls and secondary weathering and cementation effects affecting preservation as described above.

Figure 5 shows the relative depth below the top of the ground surface to the top of the garnet-bearing gravel units along the respective transects. These graphs essentially show that more material would need to be stripped to exploit the upland gravel deposits than those in the floodplains. For example, to reach the top of the garnet-bearing gravel unit in the wetland site on Traverse #4 (test pit GG-03-08) would require removal of approximately three feet of topsoil and overburden materials, whereas to reach the top of the garnet-bearing gravels in the upland site 110 feet laterally upslope (test pit GG-04-15) would require removal of nearly eight feet of topsoil and overburden. The implications of this are that additional time and associated labor costs, larger equipment and associated ground impacts, larger stockpiles, greater amounts of tree clearing and an overall larger site footprint would be required to exploit the deposits with higher strip ratios.

Figure 6 shows two stones, one from a typical floodplain deposit (right side both photos), and one from a typical terrace deposits (left side both photos). The heavy iron oxide weathering products lining the fractures are clearly evident on photos of the uncut (top left) and core of the cut stone (bottom left) from the terrace and makes the material difficult to cut and polish versus the stone from the floodplain deposit.

The upper photo in **Figure 7** shows a typical terrace gravel deposit. Note the orange-colored “rusty” zone of garnet-bearing gravels at the base of the trench lying on bedrock (bottom of photograph). The lower photo in **Figure 7** is a close-up of typical highly cemented and highly weathered terrace gravel containing abundant garnets. The orange color reflects the characteristic iron oxide and iron hydroxide cementation which makes garnets recovered from such samples unsuitable for gem extraction.

To summarize, the percentage of gemstone garnets in the bench deposits is much less than in the floodplains. Using only non-riparian panels would require more site disturbance each year to obtain a given quantity of garnets that could be recovered with less excavation in riparian areas. The quality of the gemstone resource is also poorer on the bench deposits than in the floodplains due to higher amounts of cementation of the garnet-bearing gravels. The cementation of the garnet-bearing gravels in the upland terraces makes it extremely difficult if not impossible to recover the garnets.

The life span for public garnet operations in the uplands would be shorter since there would be less area and fewer garnets. Estimated operation timelines (for both 281 Gulch and Garnet Gulch) using both riparian and non-riparian panels is 12-24 years. If only the non-riparian panels were mined, 6-12 years could possibly be expected. The life span is only relevant if visitors continue to participate with less garnet and lower quality available. Only partial recovery of the resource would occur because much of the garnet resource would be left in the riparian areas. Visitors could no longer be assured of being able to collect gem quality garnets. As noted in the minerals section of Chapter 3, the quantity and gem quality of garnet potentially recoverable is of prime importance to the visitors coming to the Emerald Creek Garnet Area.

As described in the Purpose and Need section of Chapter 1 and in the discussion above, there is a strong and long history of public support for the continued existence of the Emerald Creek recreational garnet collecting area. In order to meet that need the Forest Service has generated site development plans for removal and collection of placer gemstone deposits in the main stem of 281 Gulch and the central reach of Garnet Gulch. Taken altogether, the data provides compelling evidence that an upland-only alternative would not meet the purpose and need.

Due to the character of the placer deposits which host the gem garnets, it is considered necessary to conduct excavation operations within floodplains and riparian areas subject to the provisions of Section 404 of the CWA and other pertinent regulations. There is no practicable alternative to extraction of the garnet resource from the wetland deposits if the purpose and need for the proposed action is to be met. Please see related wetland and watershed discussions in Chapter 3 of this document.

RECOVERED GARNETS

◄ FLOODPLAIN UPLAND ►

281 GULCH TRANSECTS

T281-05-3 T281-04-3 T281-05-10 Wash Pond

281 Gulch
Upper Reach
Transect #1

T281-05-5 T281-04-4 T281-05-6 T281-05-9

281 Gulch
Middle Reach
Transect #2

T281-05-7 T281-05-8

281 Gulch
Lower Reach
Transect #3

GARNET GULCH TRANSECT

GG-03-8 GG-04-14 GG-04-15 GG-04-16

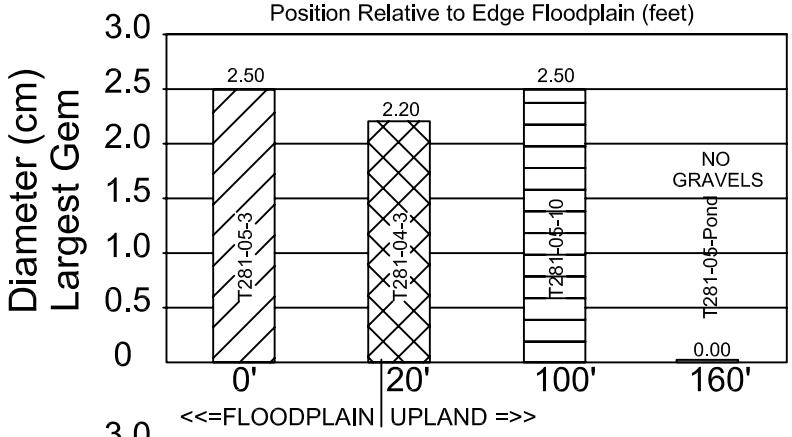
Garnet Gulch
Middle Reach
Transect #4

Figure 1

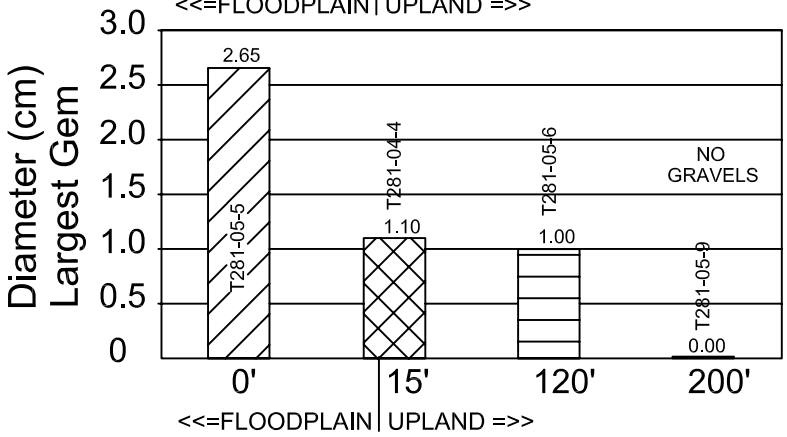
FIGURE 2
LARGEST GEM RECOVERED

Diameter (cm) Largest Gem Recovered
vs.
Position Relative to Edge Floodplain (feet)

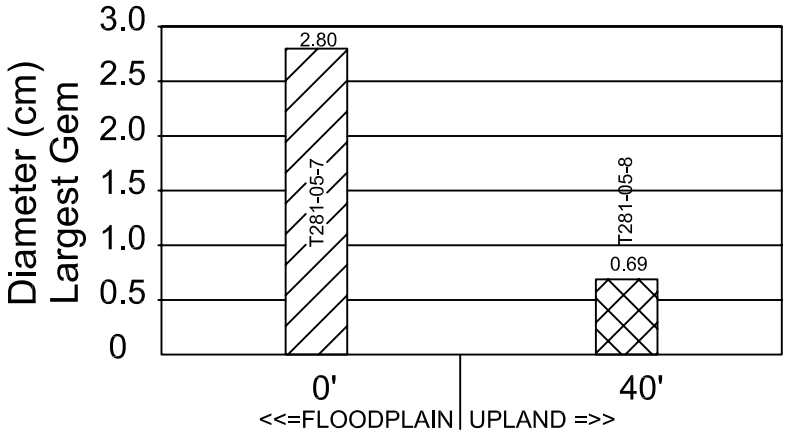
281 Gulch
Upper Reach
Main Stem
Transect #1



281 Gulch
Middle Reach
Main Stem
Transect #2



281 Gulch
Lower Reach
Main Stem
Transect #3



Garnet Gulch
Middle Reach
Main Stem
Transect #4

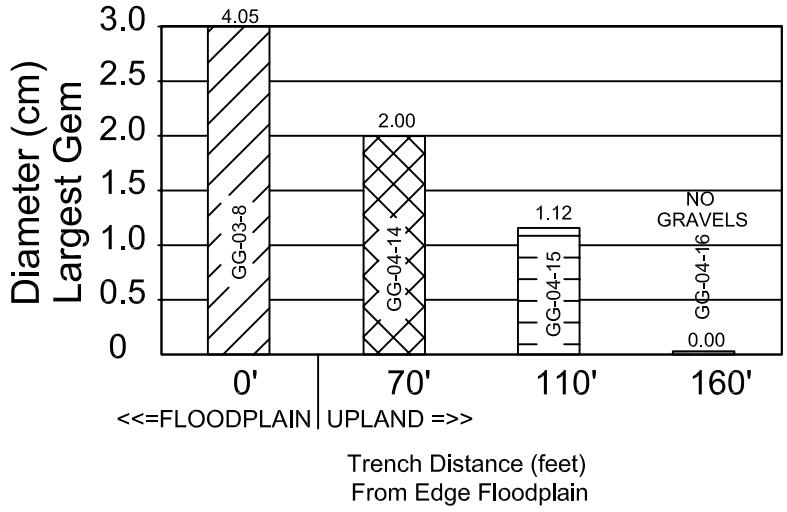


FIGURE 3
PERCENTAGE GEMS RECOVERED

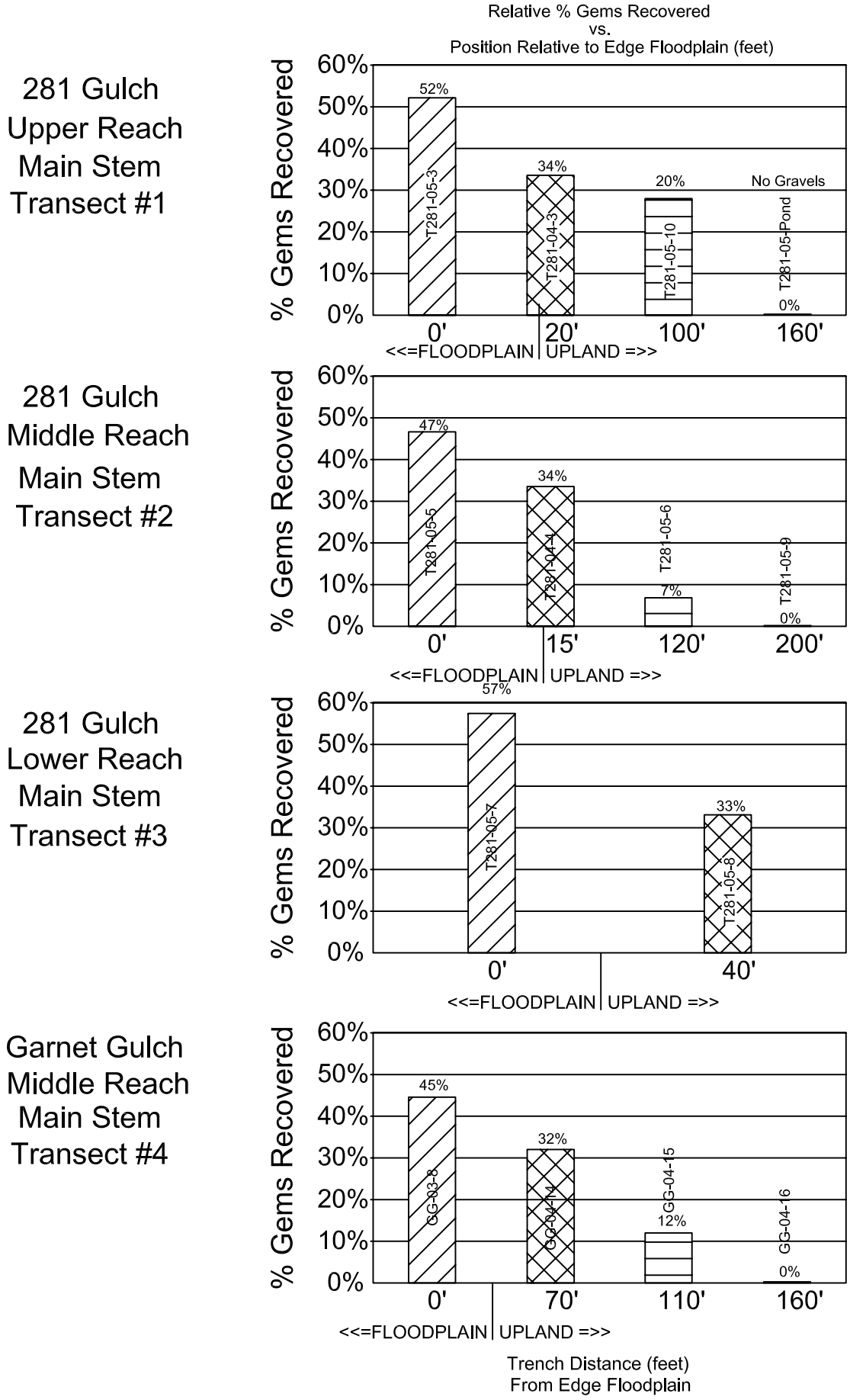
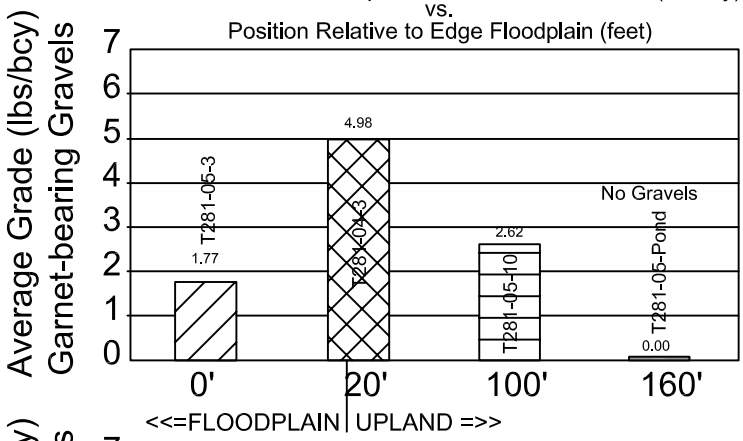


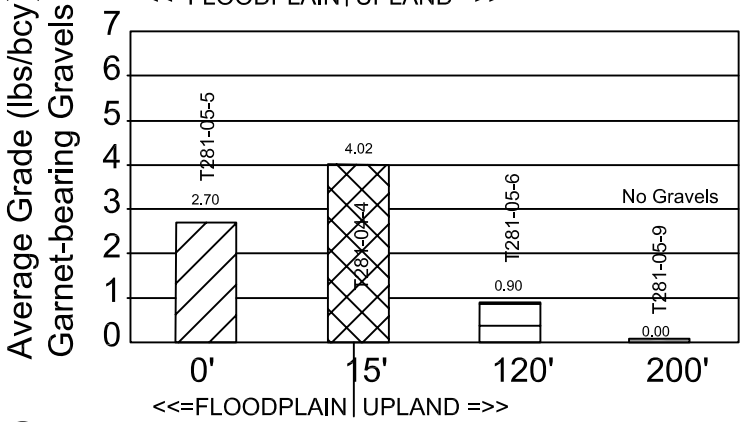
FIGURE 4
AVERAGE GRAVEL GRADE

Average Grade Garnet-bearing Gravels
in Pounds Garnet per Bank Cubic Yard Gravel (lbs/bcy)
vs.
Position Relative to Edge Floodplain (feet)

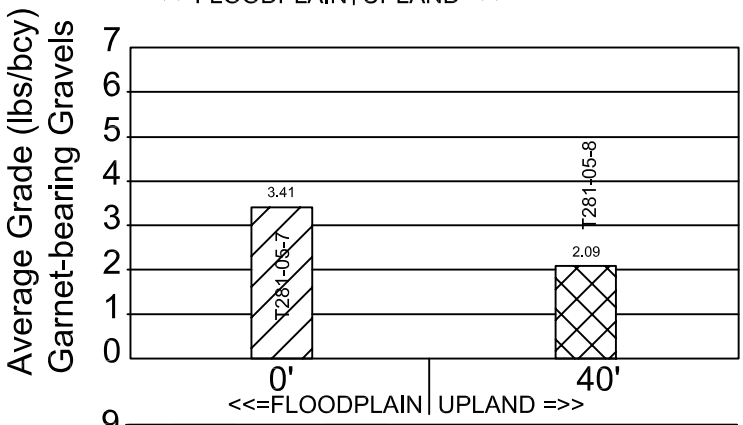
281 Gulch
Upper Reach
Main Stem
Transect #1



281 Gulch
Middle Reach
Main Stem
Transect #2



281 Gulch
Lower Reach
Main Stem
Transect #3



Garnet Gulch
Middle Reach
Main Stem
Transect #4

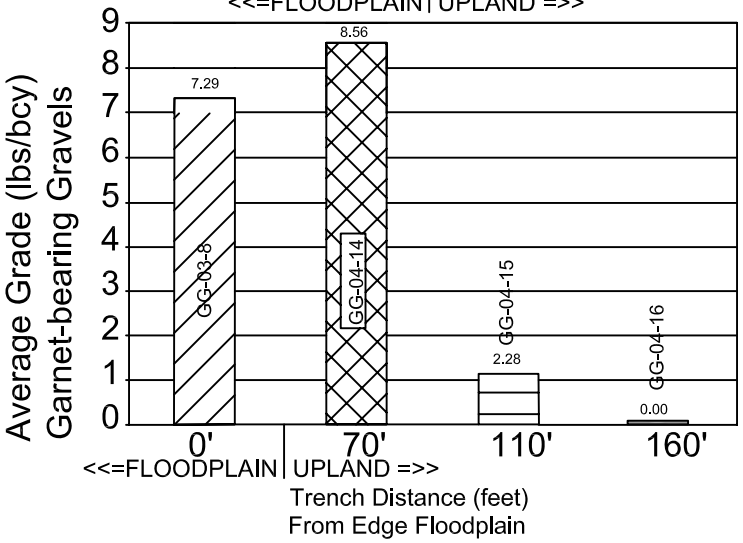
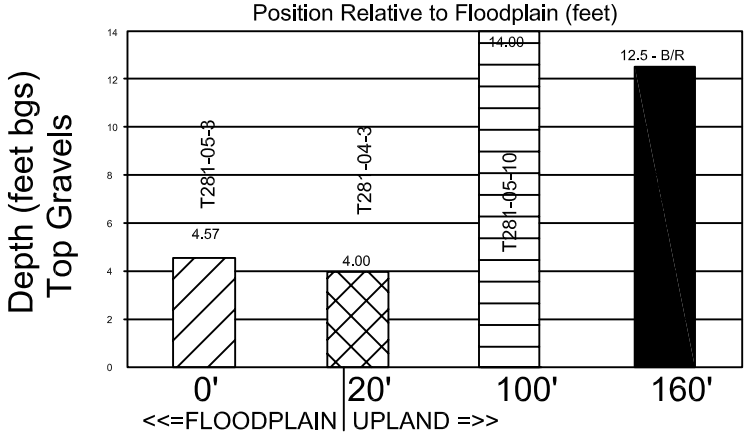


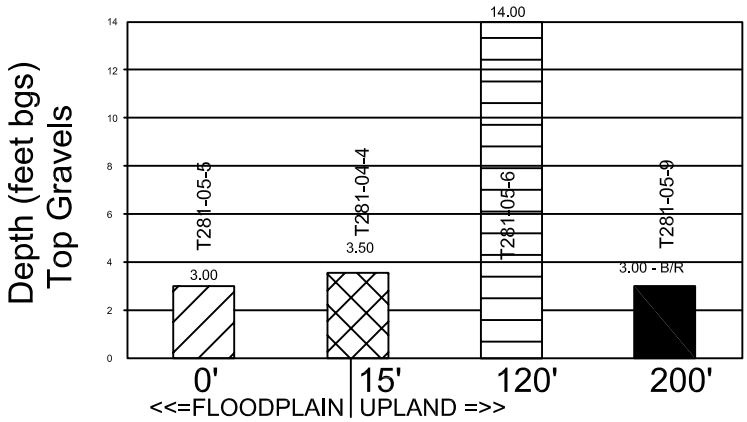
FIGURE 5
DEPTH GRAVELS

Depth (feet) to Top Garnet-bearing Gravels
vs.
Position Relative to Floodplain (feet)

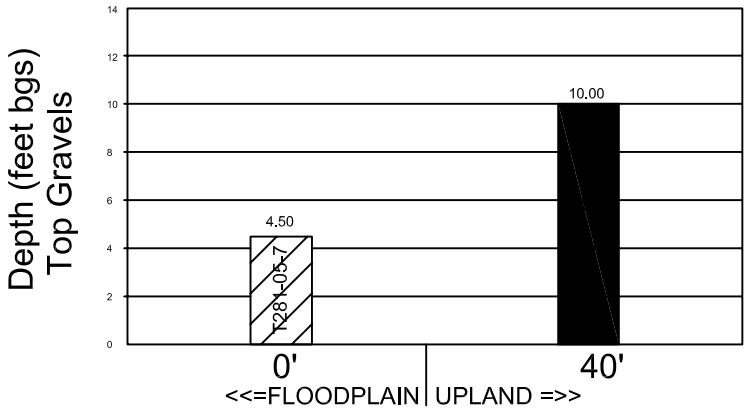
281 Gulch
Upper Reach
Main Stem
Transect #1



281 Gulch
Middle Reach
Main Stem
Transect #2



281 Gulch
Lower Reach
Main Stem
Transect #3



Garnet Gulch
Middle Reach
Main Stem
Transect #4

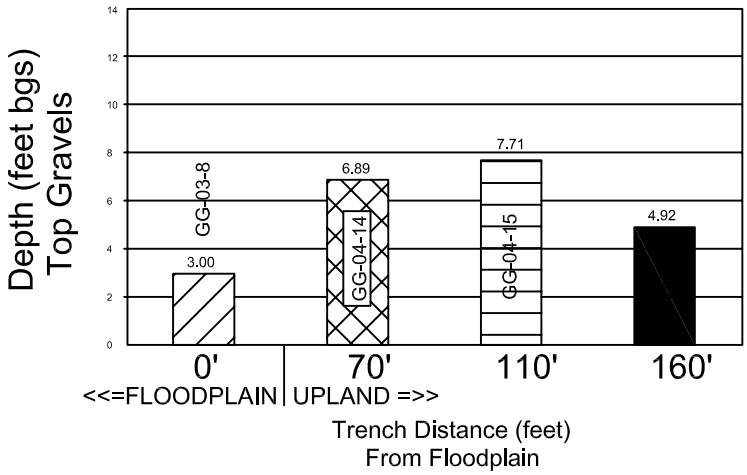


FIGURE 6

Terrace Gravel Garnets vs. Floodplain Gravel Garnets

Note numerous iron oxide-lined fractures on exterior stone

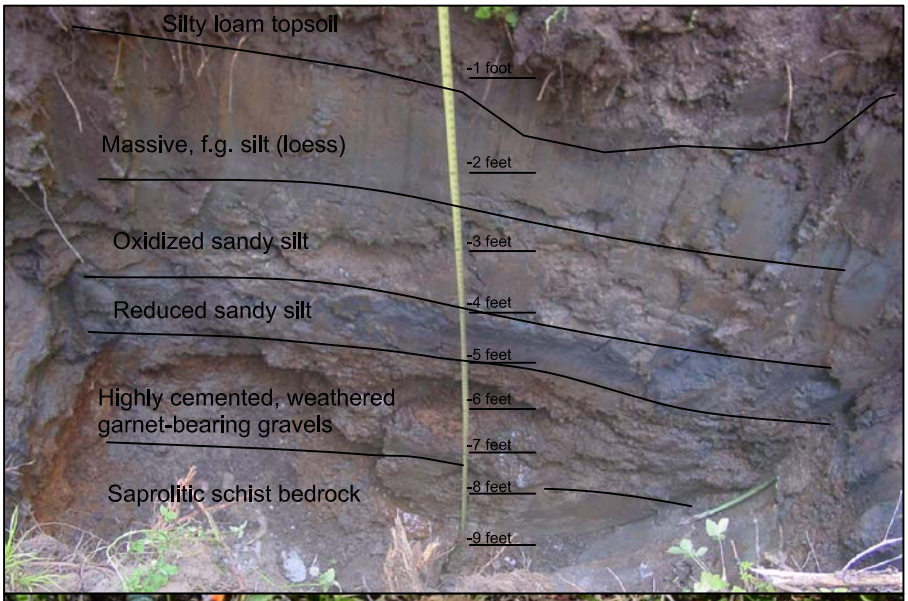
Note fewer and un-lined fractures on exterior stone

Note numerous and heavy iron oxide-lined fractures in interior cut stone

Note lack of heavy iron oxide-lined fractures in interior cut stone

Figure 7

TYPICAL TERRACE GRAVEL



Typical cross-section in upland trench showing heavily iron oxide-cemented, intensely weathered, garnet-bearing terrace gravels underlying finer-grained overburden and overlying saprolitic schist.

Typical example of highly weathered, heavily iron oxide-cemented, garnet-bearing polylithic conglomerate.
Note sample is over 50% garnet in conglomerate matrix with individual garnets up to 1 cm in diameter.
No gems were recovered after screening due to weathering and cementation.
Hand lens is ~2.5 cm in diameter.

FIGURE 7

Allow Unregulated Garnet Digging

Allowing unregulated garnet digging with no Forest Service oversight was suggested. The minerals on these lands are subject to mineral leasing laws and procedures. Leasing of hardrock minerals located on these lands can be authorized by the Secretary of Interior with the consent of the Secretary of Agriculture. The Forest Service cannot simply choose to allow unregulated garnet digging. At one time, some of the lands in the project area belonged to private companies and, because of the mix of jurisdictions and ownerships, people were digging for garnets as and where they wished. Old Forest Service records from the subsequent land exchange in the 1970s presented the scenario: sanitary conditions were “a deplorable mess” and digging activities were very often unsafe (undercutting banks, using explosives, etc.) and were causing unacceptable environmental damage. Current garnet area management allows garnet collecting by permit only. This allows for public safety, sanitation, pollution control and surface restoration. A scenario allowing unregulated digging would not protect the National Forest, would not be in the best interests of the public, and would not meet laws to protect the environment. Environmental damage, greater risk of significant changes to the hydrology of the drainage, sediment releases into the streams, and a predicted decrease in public safety would be expected. Law enforcement surveillance would have to be increased. The garnet recovery would be incomplete due to random digging compared to the systematic removal proposed in the alternatives. Reclamation would be difficult if not impossible and extremely costly due to a lack of access. More detail is included in the Recreation and Minerals sections of Chapter 3.

Stream Diversion

Another operational method using a stream diversion was considered. This could potentially lessen short-term impacts for water quality and aquatic habitat. A stream diversion would entail constructing a new stream channel one year ahead of time and then letting it harden and revegetate. This new channel would be opened up for the stream while excavating and reclaiming one half of the drainage. Another channel in the newly reclaimed area would be constructed and left to harden and revegetate. Then it would be opened for water and the other half of the draw could be excavated and reclaimed. The reason this alternative was eliminated from further study is that the two drainages are too narrow for this approach to be beneficial. The end result would be a straightened stream with large mounds on both sides to contain it. This method would have unnecessary and excessive site disturbance, more cost for short-term benefit, higher level of maintenance and monitoring, longer period of riparian disturbance, and a greater risk for runoff events to have catastrophic effects than methods in the proposed alternatives. The proposed alternatives would be using a site-specific dewatering that would be very short-term (up to a week).

Access to Garnet Gulch from Road 1487

Different access using Road 1487 for the operations in Garnet Gulch was also considered. Road 1487 forms the upper boundary of the project area. A parking area would have to be built in very steep terrain thus requiring a great amount of excavation and would be costly to build. Access from this road would also require a longer and more winding drive in steeper topography with more excavation than the proposed road. This would likely have increased public safety risks when compared to access from below via Road 447. Access into Garnet Gulch for necessary equipment operations would be very steep and would require excessive excavation. The hike for the public from this potential parking area would also be very steep, and the uphill part of the hike would be at the end of the day when people are likely tired. This road has been closed with a gate for wildlife management for over 15 years. To open this road to all traffic would adversely affect elk habitat potential in this drainage.

No New Road Construction

An alternative designed to limit disturbance by having no new road construction was considered. This option would leave Road 3781 in place to the current administrative building and would construct a trail suitable for excavator access across the West Fork of 281 Gulch over the ridge between 281 Gulch and Garnet Gulch to the recovery site in Garnet Gulch. This would have required a hiking trail along the same route. The existing parking area on Road 447 would be maintained plus the parking area at the administrative building in 281 Gulch would be enlarged. This alternative was eliminated from detailed analysis for the following reasons.

The hike from 281 Gulch to the new Garnet Gulch site would be more strenuous than what is proposed or what is currently required largely because of the steepness of the hike with higher sustained grades, but it would also be approximately 60% longer (PF: R-40). This may have made it improbable that some people would have been able to make it that far. Without vehicle access there would be no way to accommodate people who are unable to walk to the site.

In addition, the annual equipment needs still would have required a dedicated excavator route from 281 Gulch to Garnet Gulch. This route has the disadvantages of having to cross the West Fork every time an excavator is needed for work in Garnet Gulch. This route would include 2 large stream crossings and 2 smaller stream crossings and would have the impacts of a road with continued periodic use. In order to protect fisheries resources, this excavator route would have required construction of permanent stream crossings. When there are options that can avoid stream crossings, i.e. the proposed road outside of the floodplain along Garnet Gulch requiring no stream crossings, it is always preferable from a fisheries and water quality point of view to do so. Rehabilitating the excavator route every year also would have been costly. It is anticipated that the need would be at least yearly. The stability of the excavator is of prime importance from a safety standpoint, and this route would necessarily be nearly straight up the hillside resulting in unstable conditions for an excavator.

The other disadvantage is that there would be no way for emergency vehicles (ambulance, fire vehicles) to access the recovery site. Administrative needs such as the delivery of needed materials and supplies (sluice box, screen boxes, straw bales, etc.) and servicing of toilets could not be reasonably accommodated.

Also, even after closure of the public garnet area at 281 Gulch, the continued presence of people and activities and increase vehicle use in 281 Gulch would cause increased disturbance for wildlife in both 281 Gulch and Garnet Gulch.

A foot trail up the Garnet Creek drainage was also considered to avoid new road construction. It, also, had disadvantages that were insurmountable. Delivery of supplies, accessing the recovery site with needed equipment, yearly rehabilitation of the site, access for people with disabilities, and access by safety and emergency vehicles, as described above could not be addressed with this option. (PF: T-1)

Construct Road from 281 Gulch to Garnet Gulch

A new road to Garnet Gulch via 281 Gulch was considered (PF. T-1). A road along this route would be longer and much more costly than the proposed alternatives. The road would have crossed steep, moist slopes with soils types that are prone to instability. This route would include three large stream crossings and two smaller stream crossings. The larger stream crossings in steep areas would have required a large amount of fill material. When there are options that would avoid stream crossings (i.e. the proposed road outside of the floodplain along Garnet Gulch requiring no stream crossings) it is always preferable from a fisheries and water quality point of view to do so. The proposed road along Garnet Gulch from Road 447 in Alternatives B and C would need no stream crossings, the route would follow a ridge, and it would be outside the riparian area. Also with this alternative even after closure of the public garnet collection area at 281 Gulch, the presence of people and activities would cause continued disturbance for wildlife in 281 Gulch because the road would still be there and people would be in 281 Gulch and Garnet Gulch.

Truck Gravels to A Previously Developed Site for Sluicing and Washing

This option was considered in order to use an already developed site such as the Pee Wee or 281 Gulch parking areas for parking, administration, sluicing and washing. This would have eliminated the need to develop the one to three-acre administrative area in Garnet Gulch. This option also would require a higher standard and more expensive road for hauling. The operating costs of hauling garnet gravels would be more expensive than operating costs for the proposed alternatives. Because of shallow groundwater in the flood plain of the East Fork of Emerald Creek (Pee Wee Gulch or 281 Gulch parking areas) the feasibility of developing a settling pond for sluicing and washing is questionable. The sluice site would also be along a well-traveled road which would be a less rustic setting for public enjoyment.

Garnet Removal in Non Fish-Bearing Streams Only

Extensive testing for garnet was conducted from 2001 through 2005. Strom Gulch and an unnamed tributary (informally known as Mystery Gulch) are two non fish-bearing streams with potential for garnet gemstones.

The potential development in Strom Creek for recreational garnet collecting was eliminated from consideration after field work by the recreation specialist, transportation specialist, and Forest Geologist identified a number of reasons why this would not be developed in the reasonably foreseeable future (within 10 years). The most recent examination of Strom Gulch showed potential garnet resource in the lower reaches to be small accumulations of highly fractured (poor quality) garnets in small bedrock pools. A garnet source is located near the surface, however, the access for the public would be much more difficult and expensive than for other drainages that have more promise for gemstone garnet. The upper road (Road 1487) could be used for access; but it would require opening a gated area, excavating a larger area for parking, and building a 4,000-foot trail down to the collecting area (see above discussion under Access to Garnet Gulch from Road 1487). There is no parking area available on the lower road (Road 447) close to Strom Gulch. The closest space would be the existing Pee Wee parking lot, and this is 4,000 feet downstream along Road 447.

The unnamed tributary (Mystery Gulch) was also eliminated from consideration after testing for gemstones during the years 2001-2004. These tests showed some promise in one area, but it was determined that there would be only one to two years of gemstone garnets in quantities necessary for a public collection site. Developing the needed access would be too costly for such a short duration.

Panels in Areas Eliminated from Consideration for Garnet Removal

Originally garnet extraction was considered for an area above and below the proposed mining panels in Garnet Gulch. The lower panels in that part of Garnet Gulch were eliminated from all alternatives because field surveys showed this area has the most extensive and healthy populations of the sensitive plant naked mnium (*Rhizomnium nudum*) in the project area. The upper panels were eliminated from all alternatives because the gulch is very narrow. This topography makes the access difficult. In addition, implementing water and soils protection measures for a public operation would not be feasible.

Originally garnet extraction was considered for the remaining area of the West Fork of 281 Gulch just above the confluence of the two forks. Overburden thickness is over ten feet and changes quickly to over 20 feet deep. Operations in this area would require larger equipment and increased disturbance. Ten feet was used as the cutoff for excavation depth for any of the proposed mining areas. In addition the drainage is narrow and steep which would make water and sediment management difficult.

Access with a Narrow Gauge Railway

A suggestion of constructing a narrow gauge railway from Road 447 up Garnet Gulch was considered. Besides being cost-prohibitive, it would not address administrative, equipment, and safety concerns.

Mining in Previously “Dug” Areas

No Name Gulch, Pee Wee Gulch and previously dug portions of 281 Gulch were eliminated from consideration for public collecting operations in the reasonably foreseeable future. From 1974 through 2005 the Forest Service operated garnet collecting areas in these drainages using methods that entailed hand-digging which results in an incomplete recovery of the garnet. For example, one person may have dug a hole and placed the topsoil and overburden on top of another site. Even though people normally filled their holes back in, sometimes they left overburden on top of areas that were never dug.

The areas that were not mined may be small, isolated, and randomly scattered throughout a larger area that was dug. For a public collecting area, a certain amount of garnet gravels must be available. In previously dug areas, the gravel was moved and mixed with soil. It is likely that a screening plant would be required to recover garnet from previously dug areas for a public collection site.

Testing for garnets was conducted in No Name Gulch in 2001-2004. Please see the Minerals section of Chapter 3 for more detail. Testing confirmed that most of the lower reaches of the main trunk stream and

northeast tributary have been extensively worked and only small accumulations of good quality garnet remain. In the upper reaches, much of the material had been worked also. Sampling showed garnet in most samples taken. However, past digging was via potholes; this produces irregular layering of the soil. The hydraulic regime would be unpredictable and the volume of material difficult to define and locate. In addition, with the new methods for removing garnet gravels access for equipment is needed, and No Name Gulch and Pee Wee Gulch do not have good access opportunities.

Comparison of Alternatives

This section compares the alternatives by how they meet the purpose and need for the project and how they address the alternative-driving issues. This is, by no means a complete picture of how the alternatives compare to each other; much more information is available in Chapter 3 of this DEIS.

Meeting the Purpose and Need

Table 1 – How Alternatives Meet the Purpose and Need

Respond to public interest in maintaining the recreation gemstone collecting area	No*	Yes	Yes
Protects aquatic habitat and water quality/quantity	Yes	Yes	Yes
Provides safer, more efficient operation method	Yes	Yes	Yes

*Alternative A would phase out operations and close the garnet area when the accessible garnet gemstone resource is depleted in 281 Gulch (estimated two to four seasons).

Addressing the Issues

Please see Chapter 3 for a complete discussion of these issues.

Wetlands

The drainage bottoms of 281 Gulch, Garnet Gulch and the East Fork of Emerald Creek contain wetlands. Activity is proposed in a total of one acre of wetland in 281 Gulch and 2.2 acres in Garnet Gulch over 12 to 24 years.

There would not be an appreciable change in flow or circulation through the wetland areas for the following reasons: 1) annual disturbance in wetland areas would be small (1/5 to 1/3 acre or less) and temporary (one week or less); 2) current survey data of valley and channel cross-sections and longitudinal profiles would be used to reconstruct the channel; 3) each reconstructed panel surface, both wetland and channel(s), would match upstream and downstream valley and channel elevations and channel locations.

No wetlands would be lost. In all alternatives, parking lots would be removed along the East Fork of Emerald Creek resulting in ½ to 1 ½ acres of floodplains and wetlands rehabilitation which equates to a net gain of wetlands.

In Alternative A no wetlands would be lost from project activities. One acre in 281 Gulch of wetlands would be temporarily disturbed during excavation and concurrent reclamation. Approximately 1½ acres of floodplain/wetland would be reestablished along East Fork Emerald Creek through parking lot removal at Pee Wee Gulch and 281 Gulch.

In Alternatives B and C no wetlands would be lost from project activities. A total of approximately 2.2 acres of wetlands in Garnet Gulch and one acre of wetlands in 281 Gulch would be temporarily disturbed during excavation and reclamation over the life of the project. The annual rate of wetland disturbance when excavating riparian areas may be about one-quarter acre in 281 Gulch and about 0.35 acre in Garnet Gulch.

The planned removal and restoration of parking area at Pee Wee Gulch along the East Fork Emerald Creek may increase floodplain and wetlands by about ½ acre, resulting in a net increase in wetlands and floodplains.

Water Quality / Water Yield

Estimated Amount of Sediment Production and Reduction: Sediment additions from proposed activities are estimated at approximately 5.0 tons/year (PF: SW-17) although design features may reduce estimated sediment generated during channel reconstruction. Sediment basins, sediment traps, gravelling, slash-filter-windrows, vegetated buffers and other safeguards listed under the Design Features would be utilized to prevent sediment from entering the stream system from the recreational operations. Past turbidity sampling at the current collection areas indicates that water quality standards are met with the pre-sluice operations and would continue to be met with the proposed new operations.

Effects on Stream Temperature: There may be an incremental fraction of increased sunlight on the stream channels, but this would not be a consequential increase in direct sunlight on the stream channel and would not cause further impairment of beneficial uses within the East Fork Emerald Creek. The topography of the surrounding landscape and the orientation of the drainages shade the drainage bottoms, the removal of trees and shrubs would not result in a large increase of sunlight reaching the streams, and shrub and tree planting will eventually shade streams; so temperature would not increase.

Effects to Beneficial Uses: Pollutants of concern for downstream reaches that are listed as Water Quality Limited Segments (WQLS) include sediment and temperature. No change to existing beneficial uses is expected because:

- past monitoring indicates sediment levels met water quality standards at the recreational garnet collection site,
- temperature increases are not expected because the minor change in vegetative cover will not reduce stream shading,
- proposed tree and shrub planting will eventually increase shade, and
- no change to water quality is expected from the introduction of chemical pollutants.

Water Withdrawal vs. Stream Flow: No increase in water yield is expected because no consequential change in vegetative cover would occur from this activity. Significant changes in vegetative cover may influence melt rates (Packer), and water yield if over 20% (Stednick). The proposed activity would not change vegetation levels substantially. Water withdrawal is not expected to appreciably or substantially affect wetland hydrology or streamflow because:

1. The vast portion of water withdrawal would occur in the springtime during higher flow periods to fill the holding/settling pond(s) to capacity ('charging the system') for the sluice operations. Because this would be during higher flow, springtime conditions, it would not affect wetland hydrology because the soil would already be saturated. The withdrawal would occur over a 6 to 24-hour period, with a low removal rate to prevent substantial changes in flow, circulation and wetland hydrology.
2. It is anticipated there would be a need to replenish water in the holding/settling pond(s) due to leakage, evaporation, and spills and splashing from the sluice operation. This anticipated need is not expected to be large but cannot be determined until operation of the 'sluice' system has occurred for some period of time. The system would be recharged with water from the stream source after review by the District Fish Biologist and District Hydrologist. During dry periods, only a small portion of the stream flow over an extended time period would be removed for augmentation. Additionally, a water truck may be used to supplement if needed.
3. Amount of withdrawal in the initial 'charge' period would be approximately 10,000 - 20,000 gallons, which is the capacity of the holding/settling pond. This is about 0.016 - 0.23 cubic feet per second if drawn over a 24-hour period. If the water withdrawal occurs over a 12-hour time period then this is about 0.031-0.046 cubic feet per second. Or if the withdrawal occurs over a 6-hour period the estimated withdrawal rate is 0.062 - 0.093 cubic feet per second.

Aquatic Habitat

Mining activities would affect the aquatic habitat for project area streams. Extensive design features would be implemented with the alternatives. Design features and operations procedures were developed to protect aquatic habitats.

Fisheries: For the fisheries evaluation, the following table summarizes effects. For these issues, there are no differences between Alternatives B and C. The proposed activities would not jeopardize the continued existence of bull trout, the listed species that historically was found in the project area. The proposed activities would maintain habitat and thus would not affect the fishery potential.

Table 2 - Comparison of Alternatives by Stream by Fisheries Issue Indicator

	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
% RHCA Vegetation Disturbance	3	3	3	0	8	8	n/a	n/a	n/a
% Fish-Bearing Channel Alteration Annually	3	3	3	0	4	4	n/a	n/a	n/a
Cumulative % Fish-Bearing Channel Alteration (recent & future mining)	53	53	53	0	40	40	3	4	4
Road Density	3.8	3.8	3.8	3.9	4.6	4.6	3.9	3.9	3.9

Amphibians: Western toads have been found at various locations in the analysis area, in both riparian and upland habitats at and near the garnet collection site in 281 Gulch.

For Alternative A, the continuation of recreational mining for garnets in 281 Gulch would impact approximately one acre of riparian habitat. For Alternatives B and C, Forest Service recreational removal of garnets would impact a total of approximately 3.2 acres of riparian habitat in 281 Gulch and Garnet Gulch.

Based on the confirmed presence of western toads, alteration of habitat would likely impact potential breeding habitat for the western toad. It is also likely that there would be some short-term displacement of individuals and some unavoidable direct mortality of individuals associated with the mining operation. However, this impact has not been shown to eliminate western toads from the drainage. Western toads have been seen in the small water-filled depressions that result from garnet digging and in the settling ponds used to reduce sediment at the existing site. All areas impacted by garnet removal would be reclaimed in the same year as excavations. This reclamations would be designed to restore – as much as possible – breeding habitat for western toads. The fact that adult toads commonly use upland habitats also provides an avenue of escape from direct mortality.

Recreation

As noted in Chapter 1, a decision needs to be made whether or not to continue the public recreational garnet collecting area. Whether or not this opportunity is available is of utmost importance to rockhounds, lapidaries, local schools and businesses and casual visitors. For all alternatives, new methods for garnet discovery and collection are proposed in order to protect water quality, aquatic habitat, provide the public as safe an environment as possible and to fully recover the garnet resource. The recreational experience at the Emerald Creek Garnet Area is described in Chapter 3.

Access for current operations on 281 Gulch includes a parking lot off of the East Fork of Emerald Creek Road 447 and a 0.4 mile hike using a gated road (Road 3781) to the collection site administrative building. People with disabilities are allowed to make arrangements for driving up Road 3781 to the administrative A-frame building. Until operations in 281 Gulch are complete (two to four years) this access will remain the same for all Alternatives.

For Alternatives B and C, the operations would continue in 281 Gulch then be moved to Garnet Gulch. Different access would be needed for operations in Garnet Gulch. Alternative B would require most people (except disabled) to hike along a new trail and road from the 281 Gulch parking lot to the garnet collection site, 3,493 feet or 0.66 mile. The proposed hike for Alternative B up to Garnet Gulch would be longer and would also be steeper (up to 12% on the trail portion) than the current hike required to 281 Gulch. Alternative C allows for everyone except people in buses and RVs to be able to drive directly to the Garnet Gulch site.

CHAPTER THREE – AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment and environmental consequences for resources affected by the proposed action and the other alternatives. The regulatory framework and analysis methods are also discussed. It provides information of relevant past, present and reasonably foreseeable activities that occurred, are occurring, or are proposed to occur within each of the resource cumulative effects areas examined in this analysis.

Substantive Changes between Draft EIS and Final EIS

Watershed

Additional analysis was completed for water withdrawals, and discussion was added (pp. 151-154). Cumulative sediment yield discussions were supplemented (p. 145, 150), and cumulative sediment budget numbers were corrected (pp. 155, 158, 159).

Wetlands

The discussion about wetlands was augmented to include additional information and to incorporate the water withdrawal analysis (FEIS, pp. 160-163).

Past, Present, and Reasonably Foreseeable Activities

The Council on Environmental Quality (CEQ), whose responsibility it is to coordinate federal environmental efforts and work closely with agencies in the development of environmental policies and initiatives, provided guidance to federal agencies on the consideration of past actions in cumulative effects analysis. CEQ stated that "generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions" (CEQ, 2005). Cumulative impact is defined in CEQ's NEPA regulations as the "impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" (40 CFR 1508.7). CEQ interpreted this regulation as referring only to the cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions.

During the scoping process and subsequent preparation of the EIS, the Forest Service determined what information regarding past actions was useful and relevant to the analysis of cumulative effects. While CEQ found that cataloging past actions and specific information about the direct and indirect effects of a past project's design and implementation could in some contexts be useful to predict the cumulative effects of the proposal, the regulations do not require the Forest Service to catalogue or exhaustively list and analyze all individual past actions.

The Emerald Creek Garnet Area EIS provides descriptions of known past activities and their effects. There are, however, marked differences between past and current land management practices and policies. The evolution that has occurred in land management practices is the result of science, ongoing monitoring actions, and changing public values.

On the Idaho Panhandle National Forests (IPNF), early to mid 20th century road construction was focused mainly through river valleys, riparian areas, floodplains, and adjacent hillsides. The roads efficiently provided access but decreased the land's effectiveness as wildlife habitat and constricted stream channels, while providing a new avenue for erosion and discharge of sediment into streams. Roads on National Forest System lands were often an expansion of existing trails and paths so that they would accommodate newer equipment and current land uses. In some situations, roads were developed on abandoned railroad beds. In these cases, the location and design were predetermined from the previous use and era. As time

progressed, roads were "designed" and located to achieve their primary purpose, which was to provide access and haul product at a minimal cost. In the decades following World War II (1950s –1970s), the road network was rapidly expanded to support the domestic need for lumber in housing construction.

Over the last twenty years both road design and location have evolved as necessary tools to not only provide efficient access; but also to protect watershed resources. Forest Service Best Management Practices (FSH 2509.22 Soil and Water Conservation Practices Handbook) currently incorporated into road construction/reconstruction activities on the IPNF include:

- Road surfacing (gravel, etc…) was incorporated to not only provide better travel conditions; but also to prevent and control erosion from the road surface.
- Road drainage controls are now incorporated into designs that:
  - Reduce the erosive flows in ditches by providing frequent cross-drains to relieve ditch flows;
  - Avoid water movement down the road by dispersing the drainage quickly by crowning or out-sloping the road surface;
  - Stabilize ditches by lining;
  - Disperse drainage water (that often carries sediment) onto stable forested slopes before ditches discharge into waterways;
  - Allow new and existing stream crossings to safely pass extreme events (i.e. 100-year flood event).
- Special construction techniques and designs are utilized (i.e., full- or partial-benching of roads to avoid unstable side casting of waste materials; windrowing clearing slash to prevent sediment delivery to streams from construction activities themselves as well as from erosion of road fills and treads that are not yet protected with erosion control vegetation).
- Some roads are now designed to take advantage of the non-uniformities of the slopes they cross by "rolling grades" and grade breaks to prevent the potential for accumulations of water or excessive ditchflows that destabilized road beds or caused surface erosion in the past.
- Designers and planners develop road networks that avoid highly erosive or unstable slopes with the help of land system inventories, hydrologists, soil scientists, and geotechnical engineers.
- Road crossings are located at more stable sites and crossing designs now incorporate water quality and fish passage as primary design criteria, rather than criteria that just account for costs and traffic efficiency.
- Roads are located well away from streams and their riparian areas where ever practicable; and the number of crossing sites is minimized. These features are in stark contrast to past road locations that sometimes resulted in chronic sources of sediments, extended exposure of streams to direct sunlight resulting in temperature elevations, and nearly permanent reductions of the replacement sources of the structural components of streams and aquatic cover, riparian deadfall.
- In the past, when a road's utility ended, the road was simply abandoned. Some of these abandoned roads create substantial water quality and slope stability issues as they deteriorate, especially without any maintenance. Current practice is to begin restoring abandoned or no longer useful roads to a "hydrologically neutral" condition where remnants are self-maintaining and are no longer disturbing slope stability or the movement of slope water, either on or below the soil surface or the natural functions and adjustments of streams, wetlands, and other water bodies.

Impacts to forest water and soil resources from logging practices and road activities have also been reduced over the past 20 years with the introduction of Best Management Practices (BMPs) and Inland Native Fish Strategy (a.k.a. INFISH) management direction. Based on research studies, current BMPs and INFISH Riparian Habitat Conservation Areas (RHCAs) can reduce sediment yields compared with historical practices (Lee et al 1997, USDA 1995).

In 1972, Section 208 of the Clean Water Act Amendments established the regulatory framework for non-point source pollution control thorough use of BMPs. BMPs are defined in Idaho as a practice or

combination of practices determined to be the most effective and practicable means of preventing or reducing the amount of pollution generated by non-point sources (IDAPA 20.02.01). BMP monitoring is conducted annually by the IPNF to validate the implementation and effectiveness of BMPs associated with land management activities. Monitoring results are used to adapt future management actions where improvements in meeting water quality objectives are indicated. Forest monitoring of BMPs indicates that in most cases they continue to function as expected and are meeting their intent (IPNF 2002, 2003).

At the time the IPNF Forest Plan was approved (1987), the emphasis was on developing a commodity production strategy while minimizing impacts to watersheds and aquatic resources, including fish. The strategy for watershed management was constructed in the forest plan as a “maintenance” objective. In some situations, thresholds, or “minimum impact” standards defined the criteria for maintenance. To ensure that watersheds and aquatic resources were maintained during forest management activities, BMPs were applied. Despite the existing forest plan standards and BMPs, the condition of fish habitat on the forest was declining, primarily due to timber harvest and road building activities (IPNF 1992).

In 1995, the forest plan was amended to include INFISH management direction (USDA 1995). The implementation of INFISH gave greater protection to aquatic resources, especially riparian-dependent systems. The management direction provided by the INFISH amendment is designed to protect and maintain the structure and function of riparian and aquatic systems. INFISH contains goals for healthy, functioning watersheds, riparian areas, and associated fish habitats; Riparian Management Objectives (RMOs), and performance-based standards and guidelines for land management activities (i.e., timber, roads, grazing, recreation, minerals, fire/fuels, lands, riparian area management, watershed restoration, fisheries and wildlife restoration). Instead of allowing some “acceptable” level of effects on riparian and aquatic systems, INFISH aims to protect aquatic resources from detrimental effects. INFISH gives riparian-dependent resources priority over other resources in the Riparian Habitat Conservation Areas (RHCAs), so that while RHCAs are not “lock out” zones, activities that occur in them must either benefit riparian and aquatic resources or at least “not slow the rate of recovery below the near natural rate of recovery if no additional human caused disturbance was placed on the system” (USDA 1995). Incorporation of the INFISH management direction into the forest plan has led to improvement in the condition of aquatic resources by offering greater protections to the critical riparian areas. In addition, INFISH allows for and encourages watershed restoration. Restoration has occurred over the years across the IPNF. Over 1,300 miles of roads have been decommissioned on the IPNF from 1991-2003 (IPNF 2003).

Harvest methods and removal of timber products from the national forest changed substantially over time. The earliest harvest methods involved what is commonly called “high grading” which means the biggest, most valuable trees were harvested and other trees were left on site. Harvest methods in the 1950s, 1960s, and 1970s focused primarily on financial objectives of providing low-cost wood products. Harvest placement often occurred in the highest volume, easily accessible stands and often occurred within riparian areas and adjacent to streams. Most of the harvest prescriptions during this time were primarily designed to produce healthy young stands with shorter rotation ages.

Modern timber harvest prescriptions and design emphasize desired conditions of the forest after the harvest. This usually results in the retention of various amounts of trees in a post-harvest stand to address objectives that may include wildlife habitat, watershed conditions, hazardous fuels, visual quality, soil productivity, forest health and others. On sites determined suitable for timber production, timber harvest may also produce timber products on a regulated basis while compatible with other resource objectives and values. Some examples where timber production and resource objectives can be achieved simultaneously are:

- Reducing tree densities to decrease bark beetle hazard, thereby prolonging the development of the forest and maintaining tree cover;
- Managing tree canopies to limit fire spread from the forest floor to the tree crowns;
- Developing flamulated owl habitat in ponderosa pine forest through removal of smaller stems crowding larger trees, thereby providing more room to grow for the remaining trees, and open stand conditions favored by the owl;
- Designing harvest patterns across the landscape to facilitate wildlife movement, such as providing corridors and preserving travel routes for ungulates. Also, using harvest prescriptions and landscape patterns as part of a wildfire hazard reduction strategy;

- Increasing the amount of native western white pine, western larch and ponderosa pine, which generally are insect and disease resistant and are long-lived, as well as increasing western red cedar in valley bottoms, where it historically was more abundant than today;
- Using variable retention harvests to meet visual management objectives.

Other elements of modern harvest prescriptions that address specific resource objectives include retention of snags for cavity nesters, retention of down wood for soil nutrition and wildlife habitat, maintaining sediment filtering vegetation near riparian areas, and maintaining vegetation diversity through hardwood retention and protection of rare plants.

Increased environmental awareness also lead to improvements in logging systems to remove trees from the forest. Early harvests emphasized cheap, labor-intensive logging methods such as railroad, horse, short-distance jammer systems, and tractor logging. Logging systems were selected primarily by the least expensive method to transport the trees from the forest to the mill. This sometimes involved harvesting on steep slopes, creating excessive soil disturbance and increasing the risk of erosion. Streams were sometimes used as a method to transport logs from the harvest site, causing impacts to the aquatic system and adjacent riparian habitat. Road systems were sometimes dense (10 mi. per sq. mi.) to facilitate rapid and inexpensive removals, in some cases compromising water quality.

Today's logging systems reduce the threat of environmental harm in a number of ways. Tractor logging generally occurs on slopes 35% or less, and is limited to designated locations, reducing soil impacts. Skyline and other cable yarding systems are used on steeper slopes, which greatly reduce the amount of soil disturbance. Increasingly, helicopter logging is used, which extends yarding distances and thereby reduces road densities. A suite of best management practices and forest plan standards and guidelines aids in the development of the least impactive design possible. Monitoring during and after the sale is completed provides a valuable feedback loop that quickly identifies and corrects variances should they occur.

The IPNF ceased regeneration harvest of allocated old growth stands a number of years ago. Presently, the focus is on maintaining the old growth stands and allocating additional stands for future old growth as they mature. On drier sites, restoration of old growth may include various mixes of prescribed fire and thinning to restore historic more open old growth stand structures and reduce risk of stand-replacing fire. Planting shade-intolerant, fire-adapted species may also be done if these are in short supply. On these dry sites, the objective is to restore and sustain the old growth by retaining the large old trees, preserving the old growth characteristics, and restoring historic old growth structures and processes (IPNF 2003).

For the above stated reasons (changes in road construction/reconstruction and maintenance practices; implementation of INFISH management direction and watershed BMPs; and harvest practices and objectives) an individual analysis of past projects cannot be clearly compared to analysis of the proposed actions. However, the incremental effects of the proposed action when added to the effects of past, present, and reasonably foreseeable actions is displayed and provides a complete assessment of cumulative effects.

Past, present, and reasonably foreseeable future actions are activities known to have already occurred, are currently occurring, or are likely to occur in the vicinity of the proposed Emerald Creek Garnet Area project and may contribute cumulative effects. These activities are summarized below. Because cumulative effects vary in time and space, each resource specialist defined specific cumulative effects analysis areas and considered the appropriate actions from the list for their analysis. The level of effects of each type of activity varied due to location and implementation standards that were in place at the time.

The past and present activities and natural events that contributed to creating the existing condition are specifically described in the rest of Chapter 3. The existing condition reflects the history of each cumulative effects analysis area and is the starting point for effects analysis.

The following table shows activities that occurred in the past. Although the list is comprehensive, it may have some unintended omissions due to lack of records or knowledge. The listing is intended to demonstrate that relevant activities are identified and are considered in the analysis of cumulative effects for the Emerald Creek Garnet Area project. However, this list does not stand alone. It supports the cumulative effects analysis work completed by each resource specialist. Specifics of analysis methods are located in each resource section.

The level of detail for each resource analysis depends on the character of that resource, the amount of information available, importance of effects, and the scale of analysis most informative or relevant for that affected resource.

Table 3 – Past, Present and Reasonably Foreseeable Future Activities

Emerald Creek:			
Joint USDOI BLM National Training Center and USDA FS National Geology and Minerals Training Center Advanced Placer Training Workshop - Planned for 2007, potentially 5-10 mechanically excavated trenches within greater project area			X
St. Maries River Basin Outside of Emerald Creek:			
St. Maries River Basin Fuels Reduction Area 3			X
Catspur Prospecting Permit (likely within a couple years)			X
Activities proposed in the Hidden Cedar EIS			X
National Forests System Lands Projects With Signed Decisions			
St. Maries River Basin Fuels Reduction Area 2 Emerald Creek CG			X
Emerald City Timber Sale			X
Scarecrow Timber Sale (one acre of salvage)			X
Emerald Butte Access DM		X	
Bechtel Butte DM – garnet lease and prospecting		X	X
St. Maries River Basin Fuels Reduction Area 1 Palouse Divide			X
Rusty Nail Timber Sale		X	X
White Gold Timber Sale			X
Cattle grazing under the St. Maries Basin Grazing Allotment DN	X	X	X
Timber harvest other than listed above	X	X	
Mechanical site preparation	X		X
Prescribed burning	X	X	X
Tree planting	X	X	X
Road construction	X		
Road decommissioning	X		
Road Maintenance	X	X	X
Pre-commercial thinning	X	X	X
Tree pruning	X	X	X
Gopher baiting	X	X	X
Fertilizing	X		X
Wildlife habitat improvement projects	X		X
Watershed improvement projects	X		X
Firewood gathering	X	X	X
Camping	X	X	X
Berry picking	X	X	X
Christmas tree cutting (personal-use)	X	X	X
Driving	X	X	X
Fire suppression	X	X	X

Activity			
Wildfires	X	X	UNKNOWN
Authorized garnet collecting operations	X	X	X
Garnet area outfitting	X	X	X
Unauthorized garnet digging	X	X	X
Cattle grazing under the St. Maries Basin Grazing Allotment DN	X	X	X
Timber harvest other than listed above	X	X	
Mechanical site preparation	X		X
Prescribed burning	X	X	X
Tree planting	X	X	X
Pre-commercial thinning	X	X	X
Tree pruning	X	X	X
Gopher baiting	X	X	X
Wildlife habitat improvement projects	X		X
Watershed improvement projects	X		X
Fisheries habitat improvement projects	X		X
Road construction	X		X
Road decommissioning	X		
Road maintenance	X	X	X
Firewood gathering	X	X	X
Camping	X	X	X
Berry picking	X	X	X
Snowmobiling	X	X	X
Hunting	X	X	X
Hiking	X	X	X
Christmas tree cutting (personal-use and commercial)	X	X	X
Driving	X	X	X
Trail maintenance	X	X	X
Fire suppression	X	X	X
Wildfires	X	X	UNKNOWN
Weed control under the St. Joe Noxious Weed EIS	X	X	X
No future activities known	X		
Activities similar to past activities	X	X	X
Activities similar to past activities	X	X	X
Activities similar to past activities	X	X	X

AIR QUALITY

Regulatory Requirements

IPNF Forest Plan contains Forest Wide Standards for air quality (page II-34) including:

1) Participate with the State and others in the development and implementation of State Implementation Plans (SIP) that are compatible with management objectives for the IPNF.
2) All projects, contracts and permits must comply with procedural and substantive requirements of the Clean Air Act, State Implementation Plans and State Smoke Management Plans.
3) Develop and use alternative slash (biomass) disposal methods that are practical and biologically sound.
4) Encourage utilization of Forest products to reduce biomass which must be disposed of otherwise.

There are no air quality standards specific to management areas within the project area. The conformity provisions Sec. 176(c) prohibits any federal agency from taking any action that causes or contributes to violations of the National Ambient Air Quality Standards (NAAQS). The *de minimus* levels for conformity for PM 10 (*particulate matter less than 10 microns in diameter*) is 100 tons per year per project.

Analysis Area

The Emerald Creek Garnet Area Project Area is within North Idaho Airshed 12A. The boundary of 12A encompasses the area from the Washington State line east to Dworshak Reservoir and from the St. Joe/Coeur D'Alene divide south to the Clearwater/Nez Perce Forest Boundary. Activities and conditions outside the project area are considered for cumulative effects, but the cumulative effects area is the project area. Effects of the project are limited to dust and vehicle and heavy equipment exhaust which would not be transported out of the project area in an amount that would be measurable or identifiable outside of the project area. The Clean Air Act designates Class I, II, and III areas for air quality management. All of the IPNF is designated as a Class II airshed, described as having good air quality with no additional air quality restrictions other than NAAQS.

Analysis Methods / Tools

Effects of the project on air quality are limited to dust, vehicle exhaust, and heavy equipment exhaust. The assessment is based on visual inspection of the project area under current conditions. A qualitative judgment was made based on a description of the proposed activities. Existing conditions, previously completed environmental documentation of expected effects of adjacent projects (Hidden Cedar Project FEIS, St. Joe Noxious Weed Control Project FEIS) and reasonably foreseeable projects (Emerald Butte Access, Emerald City, Ruby Slippers, Scarecrow, St. Maries Grazing Allotments DN) were used for cumulative effects analysis. Particulate matter affects air quality and is composed of several substances. The largest portion consists of soil or dust that becomes airborne due to vehicles, wind, construction or agricultural activities. It also comes from burning fossil fuels (e.g., gasoline, diesel, natural gas, fuel oil, and coal), smoke or ash from wood burning, agricultural burning, or forest fires (Idaho DEQ, 2001).

Existing Condition

The air quality of the Emerald Creek Garnet Area Project Area is generally considered good throughout the majority of the year due to good air dispersion. Human caused and natural events inside and outside the project area do occasionally affect air quality. Human influences such as stationary industrial pollution sources, woodstoves, exhaust from vehicles and road dust are very minimal; however, regional haze occasionally occurs due to agricultural dust, agricultural field burning, and forest slash burning. Natural events such as dust storms and wildland fires have reduced air quality at times in the past.

Roads in the project area are gravel or dirt surfaced, and during summer months vehicle traffic kicks up dust when roads are dry. This dust generally drifts off and settles out of the air within a few minutes. Continual

traffic can keep an area dusty. In areas of residences on the way to the project area, dust control measures such as watering or application of other dust abatement materials is regularly applied. Current recreational, industrial and administrative activities in this area contribute little additional pollutants to the local airshed. The primary source of pollution would be from vehicular exhaust and dust from motor traffic in the area.

Winds in the project area are usually calm. The mountainous terrain somewhat protects the valleys from high winds. High winds are only occasionally experienced, and are usually associated with a thunderstorm or frontal system. This reduces the opportunity for blowing dust from activity areas and roadways. Winter, spring and fall are relatively wet, reducing dust production from activities and road use. Late spring to early fall is really the time when conditions are dry enough to necessitate dust abatement measures. The project area atmosphere has occasionally been smoky and has had a general haze from nearby fires as well as fires elsewhere in the northern Rocky Mountains.

Environmental Consequences

Alternative A

Direct and Indirect Effects

Dust would continue to be created from recreational, industrial and administrative vehicle use on existing gravel and dirt roads. During restoration work water may be applied to Road 3781 to control dust (FEIS, Appendix C). Air quality would remain good. Eventually, existing sources of developed recreational collecting opportunities would be exhausted, and these activities would cease, resulting in a reduction in the dust and vehicle exhaust that are associated with these activities. These impacts are so small currently that the reduction would not lead to a noticeable improvement in air quality in the project area.

Cumulative Effects

Smoke from wildfires from outside the project area would add some accumulations to the air quality during the summer and fall. Field burning and dust from wind storms in agricultural areas west of the project area will continue to reduce air quality in the project area occasionally.

Wildfire smoke is a natural part of the project area ecosystem. Frequent fire return intervals of the drier ponderosa pine forests to the west, local wildfires in the area outside the project area, and the severe and mixed intensity fire regimes of the project area generated smoke quite often during summers. Fire suppression in the Emerald Creek Garnet Area Project Area reduces wildfire smoke because fires are kept small and quickly extinguished. The amount of smoke generated from forest fires has decreased since the 1930s and the advent of effective fire suppression. Prior to this time the northern Rocky Mountains probably had 1,500 to 2,000 fires burning annually. Before modern fire suppression these fires burned until they naturally went out, and many burned for prolonged periods of 60-120 days. Quick fire initial attack and mop-up of wildfires will continue to greatly reduce smoke production and duration from levels that occurred before 1930.

Prescribed fire from outside the project area will generate smoke during the spring and fall months. Agricultural burning restrictions on the Palouse reduce levels of regional haze from that source. If activities associated with the Hidden Cedar Project are implemented, they could impact the air quality. Impacts could occur from vehicle exhaust and dust in a small way. Impacts may occur from prescribed fire for fuel reduction. Smoke produced will be dispersed generally to the northwest by prevailing winds over unpopulated forest lands and away from the Emerald Creek Garnet Area Project Area.

Grazing allotments within the project area will be sprayed for noxious weeds as planned in the St. Joe Noxious Weed Control Environmental Impact Statement. The proposed weed treatment would have short-term, localized impact on air quality because of the drift of spray particles. Generally the greatest part of this drift would settle within 25 feet of the site, although small amounts could carry greater distances (USDA Forest Service, 1993). The smell of chemicals such as 2,4-D may also persist at a spray site for several days following spraying. Application of herbicides to control weeds is to be accomplished under strict guidelines to protect the health of personnel. Areas to treatment will be posted following spray activities so

that people who want to avoid these areas can. Inhalation exposures of herbicides experienced by casual forest visitors would be very minimal.

Overall, air quality would remain good in the project area most of the time, the exceptions being periods when outside influences such as wildfire smoke or dust from wind storms decrease air quality.

Alternative B & C

Direct and Indirect Effects

Public Recreational Gemstone Collecting Areas

The effects of these alternatives are the same as Alternative A with the exception that the effects would be extended into the future for the duration of the project instead of activities ceasing in the next few years. Effects would occur at current levels. Air quality would remain good.

Reclamation and Rehabilitation

Reclamation and rehabilitation would create heavy equipment exhaust and dust. Impacts would not be noticeable except in the immediate area of the activity. During restoration work water may be applied to Road 3781 to control dust (FEIS, Appendix C). Air quality would remain good.

Cumulative Effects

Cumulative effects would be the same as those described in Alternative A with the exception that localized impacts would continue, contributing an unnoticeable amount of dust and vehicle exhaust to the air. Air quality would remain good, with the exception of periods when influences outside of the project area are reducing air quality. Project activities would not contribute to the decrease in air quality during these times.

Compliance with Regulations

The project is consistent with Forest Plan standards for air quality. It will not produce smoke. Since the annual production of $PM_{2.5}$ and PM_{10} for the Emerald Creek Garnet Area project is less than 100 tons, no conformity determination is required to meet the Clean Air Act.

ENVIRONMENTAL JUSTICE / PROTECTION OF CHILDREN

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse health and environmental impacts on minority and low-income populations. No disproportionate impacts to minority or low-income populations were identified during scoping or during any other portion of public involvement. The alternatives considered in this FEIS do not produce a substantial change with regard to the health or environmental impacts on minority and low-income populations. District Ranger, Chuck Mark, discussed the project with representatives of the Coeur d'Alene Tribe during meetings on March 21, 2005 and March 24, 2006. The St. Joe Ranger District NEPA coordinator discussed the district's planning program with the Nez Perce Tribe's archaeologist, and he said it was not necessary to provide him with information about projects on the district unless they are close to the North Fork of the Clearwater (PF: PI-106). Based on this, the alternatives would comply with Executive Order 12898.

Executive Order 13045, Protection of Children from Environmental Health and Safety Risks, requires federal agencies to ensure that their policies, programs, activities, and standards address potential risks that may disproportionately affect children. It defines environmental health and safety risks as: risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest. The alternatives considered in this FEIS do not produce a substantial risk to the health and safety of children.

FISHERIES

Regulatory Framework

Five standards are listed in the Idaho Panhandle National Forests (IPNF) Forest Plan (USDA Forest Service 1987) for fisheries and additional standards are described in the Inland Native Fish Strategy (USDA 1995 Inland Native Fish Strategy DN and FONSI) which, are applicable to the fisheries resource. The Inland Native Fish Strategy (INFS) specified Riparian Goals and Riparian Management Objectives. To achieve these goals and objectives, standards and guidelines were developed.

Section 7 of the 1973 Endangered Species Act (ESA) includes direction that Federal agencies will not authorize, fund, or conduct actions that are likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat.

Executive Order 12962 (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order."

Additional regulatory requirements related to fisheries resources (*e.g.* Clean Water Act and Idaho Water Quality Standards, Idaho 303(d) list) are addressed in the Soil and Water Resources Sections.

Analysis Area

The Emerald Creek Garnet Area project area is approximately 780 acres, located in Latah County, Idaho. All of the project area is National Forest System land. Drainages within the project area include: 281 Gulch, Garnet Gulch, No Name Gulch, Pee Wee Gulch (all of which are tributaries to the East Fork Emerald Creek) and a portion of the East Fork Emerald Creek drainage.

East Fork of Emerald Creek drainage has been selected as the cumulative effects area. This was selected because all proposed activities are located within tributaries to the East Fork Emerald. Also beyond the confluence with Emerald Creek, the conditions within Emerald Creek, a 303d listed stream, would mask any influence from this project proposal.

Affected Environment

The affected environment describes the current condition of the fisheries resource within the project area and the cumulative effects area. It is used to develop fisheries issues, which have the potential to be affected by the proposed action.

Analysis Methods

Determination of Project Issues

The determination of the project's issues is based on whether there currently exists a factor limiting the achievement of the desired conditions, and if there is potential for the proposed action to further affect that achievement or to create a new limiting factor. A limiting factor is a factor, which limits or reduces the ability of an area to produce the desired product (Everest and Sedell, 1984). The identification of a limiting factor is developed by comparing the desired conditions to the current condition.

The desired future condition for the fisheries resource is based on several sources: desired condition, as identified in the Idaho Panhandle National Forests Forest Plan "fisheries habitat will be improved" (USDA 1987, Idaho Panhandle National Forests Forest Plan, pg II-22), reference conditions, literature reviews and communication with Idaho Department of Fish and Game.

The United States Fish and Wildlife Service (USFWS) (1998) developed a list of indicators and measurement parameters (Table 4), which were used to characterize fish habitat and assist in the determination of limiting factors.

Some of these indicators and measurement parameters are described in the description of the existing condition but are not selected for use as project issues used to analyze alternatives because either: they were not selected as limiting factors or they do not have the potential to be altered by recreational mining activity or the rehabilitation activity. For example, the amount of the watershed at a certain elevation would not be altered by any proposed activity.

Table 4 - Indicators Considered in Fisheries Limiting Factor Assessment

Population Characteristics	Population size, growth and survival, diversity, isolation, persistence
Stream channel conditions	Width to depth ratio, streambank condition, floodplain connectivity
Flow/hydrology	Change in Peak/base flows
Watershed Condition	Sensitive landtype, road density, riparian harvest, elevation
Water Quality	Temperature, sediment, chemical contaminants/nutrients
Habitat Access	Physical barriers
Habitat Elements	Substrate embeddedness, large woody debris, pool frequency, large pools, off channel habitat, refugia

Table 4 and discussions below address the indicators and measurement parameters for each of the 7th level HUC streams within the cumulative effects analysis area. The current condition for each indicator is compared to the reference condition to determine the status of that indicator. A negative difference between these two is considered to be a limiting factor to fish production. The identification of the limiting factors is provided at the end of the section describing the individual drainages.

In order to determine the project's contribution to cumulative effects, a cumulative effects area was determined based on selecting an area, which contains all potential project activities and defines the largest watershed area that allows for the greatest level of resolution at various geographic and temporal scale. All past activities which occurred in the cumulative effects area are considered.

Following the descriptions of the individual drainages is a summary of the limiting factors identified for the cumulative effects area. The number and type of limiting factors are then considered in the determination of the overall condition of the streams. The overall condition of the fish habitat is categorized as:

- Unaltered: Fish habitat is considered to be unaltered if no limiting factors are identified.
- Adequate: Fish habitat is considered to be adequate if two limiting factors are identified (but neither are extremely high road density).
- Moderately Altered/Moderate Risk: Fish habitat is considered to be moderately altered from the historic range of variability and/or moderate risk of further undesirable change if two or three limiting factors are identified (including extremely high road density) or if 4 limiting factors are identified (none being Extremely high road density).
- Highly altered/High Risk: Fish habitat is considered to be highly altered from historic range of variability and/or high risk of further undesireable change if extremely high road density and at least 3 other limiting factors are identified.

The concluding paragraph of the Current Conditions section identifies those factors that are utilized as project issues. The following paragraphs describe how the measurement parameters are used.

Population Characteristics

Determination of fish species of interest for this project is based on: historic evidence within the analysis area, IPNF management indicators, and U. S. Fish and Wildlife Service Endangered, Threatened, Proposed and Candidate Species List (1/5/06).

Fish populations are characterized by the following rates; < 3 fish/100 m^2 is considered low density and > 12 fish/100 m^2 is considered excellent (PF: F-15)

Fish assemblage diversity, presence and distribution were determined based on electro-fishing surveys, snorkeling surveys and incidental sightings during habitat surveys (PF: F- 1 through F-13, and F-17)

Population isolation is based on a review of migration barriers as identified during stream habitat surveys.

Persistence is addressed in the conclusion determined in the biological assessment and biological evaluation.

Current Habitat Characteristics

Current habitat conditions are a result of the natural condition of a stream and the influences of past and present management activities on that stream. A description of past and present management activities and their potential influences are presented for each stream of the cumulative effects area.

Stream Channel Conditions

Three parameters are associated to the characteristic "stream channel condition". They are: width to depth ratio, streambank condition, and floodplain connectivity. The following provides general criteria associated to each parameter (USFWS 1998).

- Width to depth ratio describes the cross-sectional shape of a stream channel. Narrow, deeper channels provide better habitat for fish.

  H = high: the channel is wide and shallow

  M = moderate

  L = low: channel is narrow and deep.
- Streambank condition describes the stability of the banks:

  G = Good: >80% of any stream reach has $\geq$90 % stability

  F= fair: 50-80% has $\geq$90% stability

  P= poor: <50% has $\geq$ 90% stability
- Floodplain connectivity:

  G = good: off–channel areas are frequently hydrologically linked to main channel, over-bank flows occur and maintain wetland functions, riparian vegetation and succession;

  M = moderate: reduced linkage of wetland floodplains and riparian areas to main channel, over-bank flows are reduced relative to historic frequency as evidenced by moderate degradation of wetland function and riparian vegetation/succession;

  P = poor: severe reduction of hydrologic connectivity between off-channel, wetland, floodplain area and riparian area; wetland extent drastically reduced; and riparian vegetation/succession altered significantly.

For each stream the District Fisheries Biologist and District Hydrologist utilized professional judgment, combined with qualitative survey reviews, to determine the condition. Additional information is provided in the watershed specialist report for the Emerald Creek Garnet EIS.

Flow/Hydrology

Flow data was estimated for some of the streams of the analysis area (Watershed section).

Watershed Condition

- *Sensitive landtype* information was derived from a GIS layer based on soil surveys (Soils Section).
- *Road density* influence was determined based on miles of total road by acres within the individual drainages. The influence of road density to the fisheries resource was based on research conducted for the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Lee et al 1997). That research found that the "status of four non-anadromous salmonid species (which include bull trout and westslope cutthroat trout) are less likely to use moderate to highly roaded areas for spawning and rearing and if found are less likely to be at strong population levels" (Lee et al 1997 page 1347). Table 5 provides the ICBEMP definitions for road density ratings (Quigley et al 1996 page 67).

Table 5 - Total Road Density Ratings

	Very low	Low	Moderate	High	Extremely High
	0.02-0.1 mi/mi^2	0.1-0.7 mi/mi^2	0.7 – 1.7 mi/mi^2	1.7 – 4.7 mi/mi^2	4.7 + mi/mi^2

- *Encroaching road density* and *RHCA road density* utilize the same rating system as total road density (Table 5).
- *Riparian harvest* was determined by overlaying harvest history information with riparian habitat widths. Riparian habitat widths are based on INFS categories: 300 feet for perennial fish-bearing, 150 feet perennial for nonfish-bearing, and 50 feet for intermittent.

  Good condition = riparian areas with less than 13% harvested in the last 15 years

  Moderate condition = riparian areas with between 13 and 33% harvested in the last 15 years

  Poor condition = greater than 33% of the riparian area harvested in the last 15 years (Biological Assessment: St. Joe River Basin/NF Clearwater 1998).
- *Elevation* was determined by GIS map layer.

Water Quality

- *Stream temperature* data was collected using automated Onset temperature recorders. The criteria used for temperature are based on Idaho State criteria (Idaho DEQ 2005) and are shown in Table 6. A stream is considered to be temperature impaired if the temperature standard is exceeded greater than 10% of the specified time period (PF: F-26).

Table 6 - Temperature Criteria Standards

Dates	April 15 – July 15	Juvenile 6/1-8/31	Spawning 9/1-10/31
Maximum Daily Maximum Temperature (MDMT)	13 °C		
Maximum Weekly (7-day average) Maximum Temperature (MWMT)		13 °C	
Maximum Daily Average Temperature (MDAT)	9°C		9°C

- *Sediment* production is correlated to the number of stream crossing because a considerable amount of sediment is delivered from these locations (USDA, St. Joe River/NF Clearwater Basins BA, 1998)

  G = Good: fewer than 0.5 stream crossings per stream mile

  M = Moderate: between 0.5 and 1.0 stream crossings per stream mile

  P = Poor, if stream crossings exceeded 1.5 crossing per stream mile

- *Chemical Contaminants/nutrients (USFWS 1998)*

  L = low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches

  M = moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach

  H= High levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach.

Habitat Access (USWFS 1998)

Culvert accessibility was evaluated based on Region 1 Passage Through Crossings Assessment (PF: F1 through F-11).

N = No man-made barriers present in watershed. Upstream and downstream fish passage at all flows.

P = Partial barriers: man-made barriers present in watershed do not allow upstream and/or downstream fish passage at base flows.

Y = Yes: man-made barriers do not allow upstream and/or downstream fish passage at a range of flows.

Habitat Elements

The description of the current habitat elements is based on quantitative surveys conducted in 1998, 2001 and 2002 according to procedures outlined in the Region 1 Fisheries Habitat Evaluation Handbook (FSH2609.23) or the R1/R4 methodology (Overton et al 1997), woody debris inventory, qualitative stream reviews (1996-2005), historical records, aerial photographs review, review of the watershed report, and discussions with Idaho Department of Fish and Game (IDFG) and U.S. Fish and Wildlife Service (USFWS). All quantitative survey data, irregardless of age of data, remain valid based on recent qualitative reviews of the streams and lack of habitat altering events.

Reference Condition

Population Characteristics

Bull trout and westslope cutthroat trout were historically documented in Emerald Creek (Fields, 1935). The Fields (1935) document does not address streams the size of the East Fork of Emerald Creek. However it is assumed that both species utilized the East Fork in the past because there are no barriers which would prevent them accessing that stream, and because westslope cutthroat trout are currently present.

Habitat Characteristics

Stream Channel Conditions & Flow/Hydrology

The project Water section of Chapter 3 describes the reference condition of the project area for stream channel conditions and flow / hydrology.

Watershed Condition

The amount of sensitive landtypes does not alter based on natural events or human activity, therefore the current condition is also the reference condition (Table 7). Road density and riparian harvest are both human-created parameters and therefore would not have existed in a reference condition.

Table 7 - Watershed Conditions

"Mystery Gulch"	423	4	22	9
281 Gulch	365	3	16	19
Garnet Gulch	334	3	21	0
No Name Gulch	369	3	22	0
Pee Wee Gulch	108	1	33	0
Strom Gulch	190	2	22	0
Flat Creek	484	4	17	20
Swamp Creek	538	5	19	0
Post Creek	588	5	19	0
Highline Creek	616	5	17	22
Little East Fork Emerald	2606	23	17	5
East Fork Emerald (excluding named tributaries)	4,800	42	15	10
Total EF Emerald Drainage	11,421			8

Water Quality

- Water temperatures would have been conducive to fisheries production based on the known historic presence of fish in the project area.
- Sediment conditions would have been such that they supplied the appropriate combination of substrate sizes to provide spawning gravel and rearing habitat. No stream crossings would have been present to alter sediment input.
- Chemical contamination and nutrient loading are parameters created by human activity therefore in a reference condition they would not have been an issue.

Habitat Access

Fish populations utilizing the streams of the project area would have had access to approximately 16.5 miles of suitable habitat.

Habitat Elements

Biologically preferred conditions of bull trout and westslope cutthroat trout provide insight into reference conditions for aquatic resources in the Emerald Garnet analysis area. The preferred habitat of bull trout and westslope cutthroat trout can be generalized as cold, clear streams that possess rocky, silt-free riffles for spawning and slow, deep pools for feeding, resting, and over-wintering (Young 1995; Reel *et al.* 1989), therefore it is assumed because these fish were known to occur in this area that these conditions existed.

Based on topographic features, aquatic habitats would likely have included a diverse mix of fast and slow water habitats. It is expected that beavers would have had an influence on channel morphology and associated habitat conditions in the area.

Based on the forested nature of this area the reference conditions for instream cover would likely have consisted of a high percentage of undercut banks, over-hanging terrestrial vegetation, and accumulations of large woody debris.

Current Conditions

Population Characteristics

Bull Trout

Bull trout population status reviews have found considerable reductions in the distribution and abundance throughout their historic range (USDA Forest Service 1996a, An assessment of the conservation needs of Bull Trout; Rieman and McIntyre 1993). The IPNF Forest Plan monitoring reports (1998, 2000, 2002, and 2003) indicate that bull trout populations appear to be stable throughout most of northern Idaho (USDA Idaho Panhandle Forest Plan Monitoring and Evaluation Reports 1998, 2000, 2002 and 2003).

Genetic analysis has shown bull trout populations in the St. Joe River system to be a unique stock though they are closely linked to the upper Columbia River clad - one of three major groupings of bull trout throughout the Columbia and Klamath River drainages (Williams, unpublished). Currently, bull trout are known to occupy habitat in the St. Joe River and many of its tributaries. However, in a status review of bull trout on the Idaho Panhandle National Forests, stocks from the St. Joe River system were considered to be at moderate risk of extinction (Cross 1992).

Two unconfirmed sightings of bull trout were reported in the Emerald Creek Drainage (Emerald Resource Unit EIS, page III-42, 1993). No bull trout have been located during recent snorkel and electrofishing surveys within the East Fork of Emerald Creek (2001 and 2004) (PF: F-1).

Westslope Cutthroat Trout

Population status reviews of the westslope cutthroat trout (WCT) within the United States, determined that currently WCT occupy an estimated 59% of the historically occupied habitat and in Idaho populations occupy almost 96% of the historical range (Shepard, et. al., 2003). Idaho Fish and Game summarized 20 years of snorkeling data on four streams (including the St. Joe) in Idaho which indicates that “westslope cutthroat trout have maintained or increased their population abundance over a very large area within the state of Idaho during the past 15-34 years” (Idaho Fish and Game, 2003, p. 2). Idaho Fish and Game surveyed the St. Joe River from 1969 until present, except for several years during the 1980s. These surveys indicated that current populations are lower than the peak years in 1977 and 1980, but higher than the earliest years of the survey (Idaho Fish and Game 2003 pg 43). The Northern Region of the Forest Service lists the westslope cutthroat trout as a sensitive species (PF: F-37). IPNF Forest Plan monitoring reports (1998, 2000, 2002 and 2003) indicate that westslope cutthroat trout populations appear to be stable throughout most of northern Idaho.

Table 8 displays the distribution of fish species in the streams of the project area. The data is from presence/absence surveys which were very limited efforts. It does, however, provide a comparison of the different streams within the East Fork Emerald Creek drainage. The East Fork Emerald Creek was surveyed more extensively and can be compared to other streams in the St. Joe Drainage. These surveys resulted in

densities of westslope cutthroat trout ranging between 4.0 to 12.6 fish/100 m^2, which is considered good to excellent (PF: F-1).

Non-native Species

Rainbow trout were planted in the St. Maries River from 1968 to 2001 (PF: F- 16). No recent surveys have located rainbow trout within any of the tributaries of the project area (PF: F-1 through F-13).

Management Indicator Selection (MIS)

Native bull trout and westslope cutthroat trout were selected as appropriate MIS for the fisheries analysis of these watersheds, because of their historic presence in the project area and because they are either a threatened or sensitive species.

The U.S. Fish and Wildlife Service species list is developed for each Idaho county (USFWS 1/5/06). The cumulative effects area for this project includes Latah County, and a small portion is within Shoshone County. The Shoshone County list identified bull trout as a threatened species within the county. The Latah County list includes steelhead (*Oncorhynchus mykiss*) as a threatened species within the county. This species is not addressed in this document because there are no historic records of steelhead in the Emerald Creek Drainage, the St. Maries Drainage, the St. Joe Drainage or in the Coeur d'Alene Basin.

Table 8 - Fish Distribution by Stream

Emerald		E[2]	0	X	0	X
EF Emerald	53	E	0	0.022	0.001	0.022
Little East Fork Emerald	17	E	0	0.023	0.009	0.03
"Mystery Gulch"	0	H	0	0	0	0
281 Gulch	5	H	0	X	0	0
Pee Wee Gulch	3	E	0	0.05	0	0
Garnet Gulch	5	E	0	0.06	0	0
No Name Gulch	1	E	0	0.03	0	0.057
Strom Gulch	0	H	0	0	0	0
Flat Creek	2	E	0	0.004	0	0.003
Swamp Creek	6	E	0	0.001	0.003	0.01
Post Creek	6	E	0	0.004	0	0.01
Highline Creek	2	E	0	0.005	0	0.026

X = species present but catch not calculated

1) E = Electrofishing survey, H = Habitat Survey (incidental observation)

2) Based on electrofishing conducted by Konopacky Environmental for the Emerald Creek Garnet Company

Habitat Characteristics

The following tables and text display the issue indicators or measurable factors for each of the streams within the cumulative effects area. These features help determine the current condition and trend of the stream

and its potential. The informally named tributary "Mystery Gulch", and Strom Creek are not addressed further due to the lack of fish use of those streams.

Table 9 - Stream Channel Conditions

East Fork Emerald	M	G	M
Little East Fork Emerald	L	G	G
281 Gulch	M	P/G[1]	G
Pee Wee Gulch	M	G	G
Garnet Gulch	M	G	G
No Name Gulch	M	G	G
Flat Creek	G	G	G
Swamp Creek	G	G	G
Post Creek	G	G	G
Highline Creek	G	F	M

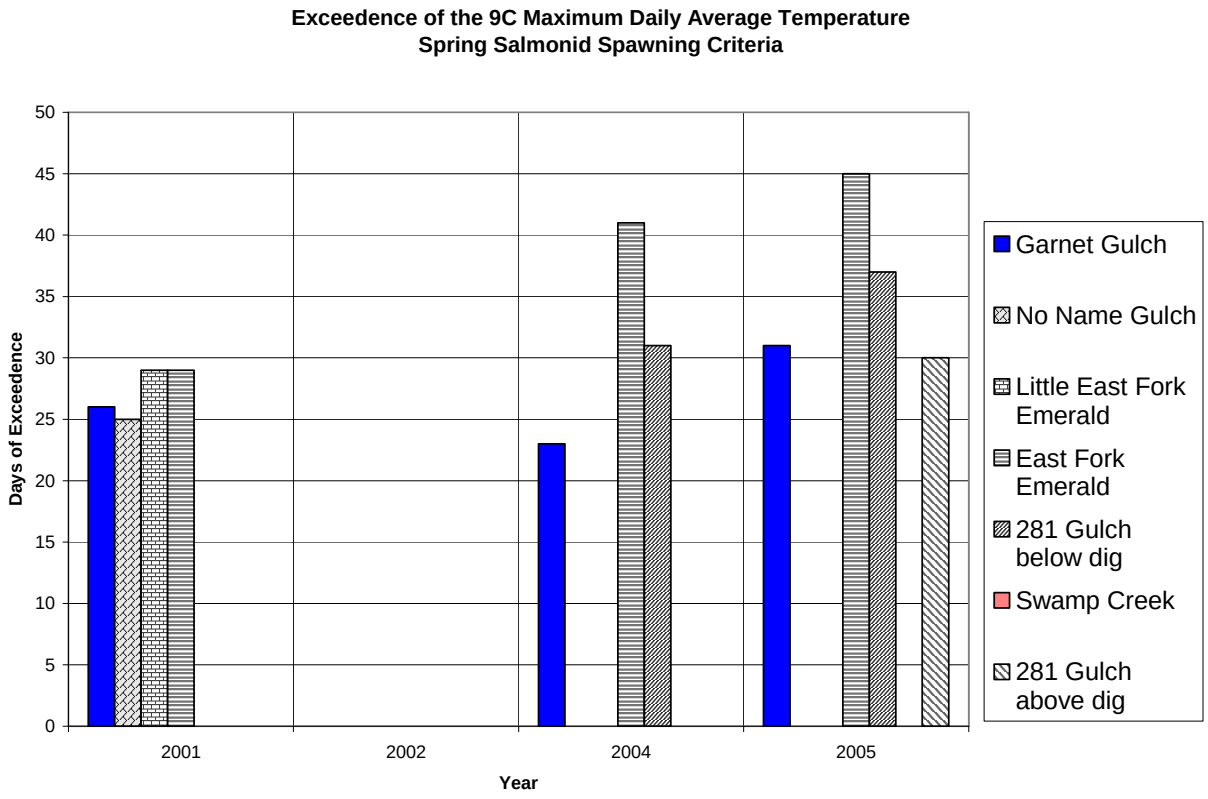
[1] In the areas associated with the recent garnet digging the banks are unstable therefore poor condition; in areas where there has not been digging or where the digging occurred in the past the banks are vegetated and in good condition.

Table 10 – Watershed Conditions (GIS-based) and Habitat Access

281 Gulch	4.4	High	6.5	2.1	6	Y
Garnet Gulch	3.9	High	5.6	1.5	10	Y
No Name Gulch	3.8	High	8.5	1.9	10	N
Pee Wee Gulch	0.8	Moderate	1.4	0.7	0	N
Flat Creek	5.8	Extremely High	11.0	4.2	7	N
Swamp Creek	4.8	Extremely High	2.7	0.9	10	N
Post Creek	3.6	High	2.3	0.5	8	N
Highline Creek	5.2	Extremely High	9.0	7.7	11	N
Little E Fork Emerald	6.8	Extremely High	9.4	3.9	18	N
East Fork Emerald	3.9	High	12.1	7.0	10	Y

*** N = No Barrier, NB= Natural barrier, H = Human created, UK = unknown**

Figure 8 - Water Quality Conditions (Temperature)



* In 2002 temperature recorders were not placed until mid July, therefore not within the spring spawning period. Temperature recorders were only placed in Swamp Creek in 2002/

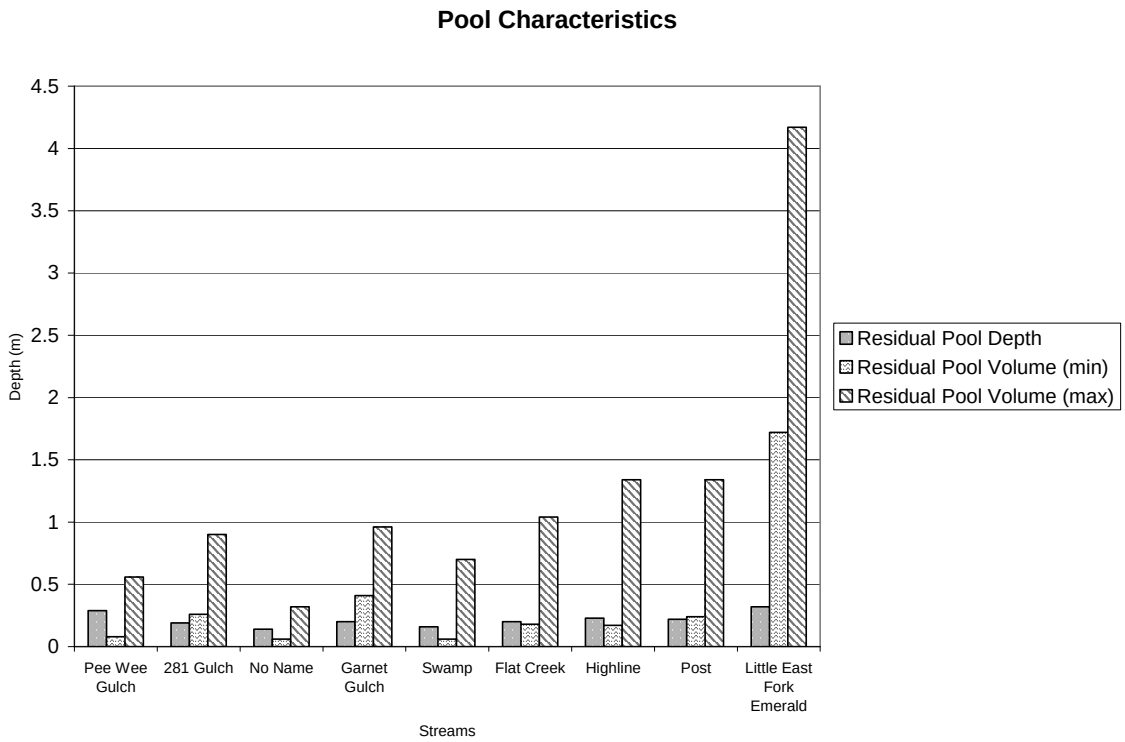
Individual Drainage Discussion

281 Gulch

Historic Activity: Timber harvest activity prior to 1933 treated approximately 65% of the lower portion of the drainage (review of 1933 aerial photographs) and, according to the district cultural resources specialist, was likely broadcast burned following the harvest. Forest Service operated recreational garnet mining began in this drainage in 1985 and has continued to the present. Activity began at the upper ends of the West and East Forks and has been working progressively downstream. Currently operations are occurring a short distance upstream of the confluence of the East and West Forks. The current operating season is from July 1 (East Fork) and Memorial Day weekend (West Fork) until Labor Day weekend. During the extraction season the East Fork is diverted through a pipe approximately 150m long. Settling ponds constructed below the mining activity on both forks reduces the amount of sediment which continues downstream. Several other mitigation measures have been utilized to reduce the amount of sediment being transported downstream by this operation (see Recreation section of this document). Following the seasonal closing the stream is rehabilitated to reduce the amount of sediment produced from the mined sections. The District Hydrologist has conducted monitoring of this operation (see **project file**).

Habitat Elements

Figure 9 - Pool Characteristics: Residual Pool Depth & Residual Pool Volume



Flow/Hydrology: Flow at the culvert on 281 Gulch (under Road 447) was estimated to be approximately 0.22 cu ft/sec during March (PF: F-30). Estimates of the discharge for the two-year peak flow ranged between 12 and 15cfs depending on the estimation method utilized (Watershed Report).

Watershed Condition: 281 Gulch has a high total road density (Table 10). Six percent of the riparian length has been harvested associated with timber sales within this drainage, primarily in the headwaters. An additional 1.5 acres of riparian vegetation was disturbed in association with previous garnet mining in the East and West Forks of 281.

Water Quality: Figure 8 displays temperature information. In general temperatures are higher below the garnet collection site than they are upstream of the collection site. This is likely due to the potential for warming in the ponds. Temperatures below the garnet removal site exceeded Idaho state criteria each year, when it was monitored beginning prior to July.

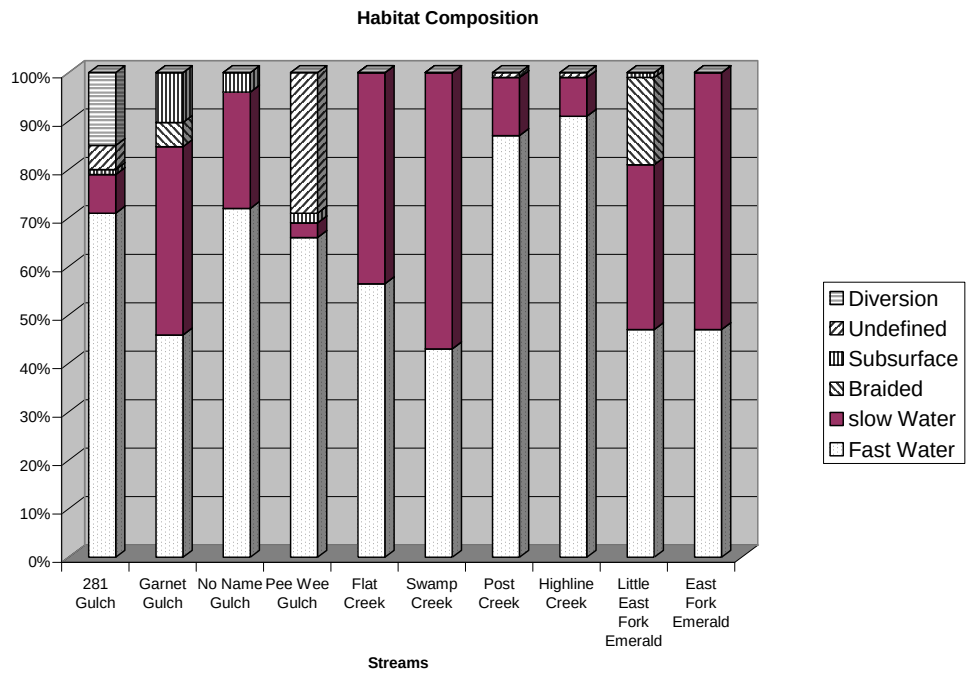
Sediment is generated within the active dig sites, but settling ponds within the basin are collecting fine sediments from the two tributaries before reaching the main stem of 281 Gulch. Some sediment does become entrained within the system during cleaning of the settling ponds. Turbidity was measured in 2004 and 2005. This sampling indicates that the garnet mining activities are meeting water quality standards (Watershed section). The watershed report contains additional information on sediment production. Additional sources of potential sediment production include: two stream crossings in the headwaters, one stream crossing near the mouth, roads along six percent of the stream course and six percent harvest of the riparian zone.

There is no chemical contamination of the site. The gas-powered pump which is used to drain the settling pond at the downstream end of the West Fork of 281 Gulch is contained within a spill containment system.

Nutrient levels may be slightly higher than reference conditions due to cattle which occasionally enter this drainage, usually during the later part of the summer.

Figure 10 - Habitat Composition

(Slow water habitats are pools. Fast water habitats include: cascades, riffles, runs, glides.)



Habitat Access: There are two culverts on fish-bearing portions of 281 Gulch. Fish would have to jump slightly to enter the culvert under Road 447 which would create a migration barrier to some fish. The other culvert under Road 3781 is at stream grade and is therefore not a migration barrier.

Habitat Elements: In 2001 a quantitative habitat survey was conducted (approximately 3,300 feet) of the main stem of 281 Gulch and extending up a portion of the East Fork. A qualitative survey continued beyond the quantitative survey and determined that fish use would continue another 1,000 feet. Overall the stream habitat is primarily riffle habitat, with the segments in the mined areas having slightly higher percentages (Figure 10). The unmined segment (approximately 1650 feet) has a higher number of pools than the mined segments, when the settling ponds are not included. The pool qualities; residual pool depth and residual pool volumes, in the mined segments are similar to those of the unmined segment and the segment upstream of the recent mining.

Stream substrate is generally small-sized ranging from small gravel to fines. Substrate composition is largely a function of the parent schist geology, but fine substrate downstream of mining activity further restricts the quantity and quality of spawning habitat.

The riparian zone within the unmined areas has primarily brush species with timbered areas encroaching from the lower hill slopes. The riparian zone within the mined area is largely devoid of brush and tree species though grasses, sedges and some planted trees occur in rehabilitated sections.

Summary: 281 Gulch is used primarily as a spawning and early-rearing stream; however, the inherent properties of 281 Gulch (e.g. small size and schist geology) naturally limit the potential for aquatic habitat conditions regarding native trout. Land management activities (primarily associated with mining and timber harvesting) within 281 Gulch have changed aquatic habitat conditions. The main limiting factors for fish production within 218 Gulch are higher stream temperatures, a culvert migration barrier, high total road density, and simplified habitat. The habitat of 281 Gulch is considered to be moderately altered / at moderate risk.

Garnet Gulch

Historic Activity: Extensive management activity has occurred within this drainage in the past. A review of historic aerial photos (1933) indicates that approximately 85% of the drainage was harvested and, according to the district cultural resources specialist, was likely broadcast burned following the harvest. There has been no organized Forest Service garnet mining operation in this drainage, but testing of the garnet resource did occur in 1978. Anecdotal information about the mining of the Emerald Creek area reports that unregulated rock hounding did occur in this drainage (PF: F-29).

Flow/Hydrology: Flow at the culvert on Garnet Gulch was estimated to be approximately 0.16 cfs during March (PF: F-30). Estimates of the discharge for the two-year peak flow ranged between 10 and 13cfs, depending on the estimation method utilized (Watershed Report).

Watershed Condition: Garnet Gulch has a high total road density (Table 10). Some riparian harvest has occurred within this drainage, but the drainage is still considered to be in good condition (Table 10).

Water Quality: Temperature data is displayed in Figure 8. Temperatures in general are slightly lower than the majority of the other streams within the East Fork Emerald Creek drainage; however, some days do exceed the Idaho State Criteria for spring salmonid spawning temperatures.

Sources of potential sediment production include: five stream crossings in the headwaters, one stream crossing near the mouth, roads along six percent of a stream course and ten percent harvest of the riparian zone.

Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: The culvert under Road 447 requires a slight jump for fish to get into the culvert. This culvert is a low-flow migration barrier.

Habitat Elements: There is approximately 4,000 feet of fish-bearing stream in the Garnet Gulch drainage. Garnet Gulch passes through a culvert immediately upstream from its confluence with the East Fork. The stream averages about four feet wide. The substrate is predominately gravel. Woody debris is plentiful and stable in the channel. The quantitative survey identified that the instream habitat is primarily run and pool (Figure 10). The pool habitat was primarily created by woody debris. Pools are slightly more developed in the second reach (Figure 9). The second reach contains two large (22.7 and 13.5 m long), human-created pools. During the survey, which occurred in June, short segments of the channel, downstream of and within the section proposed for mining, were subsurface. The riparian zone is primarily forbs with some conifers. The vegetation becomes denser moving upstream to a point where it is difficult to see the channel.

Summary: Garnet Gulch is primarily a spawning and early rearing stream. Compared to other fish-bearing streams of similar size within the drainage Garnet Gulch has higher fish utilization, lower temperatures, similar or higher percentage of pool habitat and a higher percentage of subsurface flow. Although temperatures are lower than other streams within the drainage; high temperatures, high road density and the culvert low flow migration barrier are the main limiting factors to fish production within Garnet Gulch. The habitat of Garnet Gulch is considered adequate.

No Name Gulch

Historic Activity: A review of historic aerial photographs (1933) indicates that almost this entire drainage (about 95% based on aerial photograph estimation) was harvested and, according to the district cultural resources specialist, was likely broadcast burned following the harvest. No Name Gulch was mined for garnet gems from 1974 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream about 700 feet. At this point the stream forked. Another 1,000 feet (approximately) of stream up the left fork of No Name and approximately 500 feet up the right fork of No Name were also mined. A variety of reminders of the past mining are still evident within the stream channel: metal fence posts, wood planks, etc.

Flow/Hydrology: Flow at the culvert on No Name Gulch was estimated to be approximately 0.10 cfs during March (PF: F-30).

Watershed Condition: No Name Gulch has a high total road density (Table 10). Some riparian harvest has occurred within this drainage, but it is still considered to be in good condition (Table 10).

Water Quality: Temperature data is displayed in Figure 8. Only one year of temperature data was collected for No Name Gulch. In general, temperatures in No Name are slightly lower than the majority of the other streams within the East Fork Emerald Creek drainage, however temperatures still exceed the Idaho State Criteria for spring salmonid spawning temperatures on some days.

Sources of potential sediment production include: six stream crossings in the headwaters, one stream crossing near the mouth, roads along 8.5 percent of stream courses and ten percent harvest of the riparian zone.

Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: The culvert under Forest Service Road 447, near the confluence with the East Fork of Emerald Creek, is undersized as evidenced by the erosion around the inlet of the culvert. The bottom of this culvert is also rusting through. This culvert would be a migration barrier to some aquatic species but most fish species would be able to pass through.

Habitat Elements: A qualitative review of this stream was conducted in July 2000 by the district fisheries biologist (PF: F-9), and a quantitative habitat survey was conducted in June 2001 (PF: F-9). The reviews began at the confluence with the East Fork of Emerald Creek. The quantitative review was conducted on approximately 1,300 feet of stream, the main stem and up the right fork. No Name Gulch is a small stream averaging 3.3 feet wide, ranging between 1.6-5.9 feet. The quantitative survey divided the stream into two reaches based on valley bottom, gradient and substrate. The substrate is predominately small gravel. The overall habitat (Figure 10) was primarily fast water habitats (72%). Slow water habitats (pools) comprised only 24% of the stream. Approximately half of these pools are created by woody debris although the majority of the woody debris is small due to the limited amount of conifers in the riparian zone. Pools are less developed with lower residual pool volumes and depths in this drainage than in Garnet Gulch (Figure 9).

The riparian zone is primarily grass and forbs. An old road parallels the channel for about the lower ¼ mile of stream, and according to the historic aerial photos (1933) the road continued up the left fork of No Name Creek at one time. Beyond the end of the old road the stream has greater quantities of woody debris, and the riparian zone is predominately brush and sparsely spaced conifers.

Summary: No Name Gulch is primarily a spawning and early rearing stream. Limiting factors within No Name Gulch include higher stream temperatures; an undersized, rusting culvert; lower amounts of slow water habitats; and lower quality slow water (pool) habitat. The habitat of No Name Gulch is considered moderately altered / at moderate risk.

Pee Wee Gulch

Historic Activity: This drainage received extensive management activity in the past. A review of historic aerial photographs (1933) indicates that almost this entire drainage (about 95% based on aerial photograph estimation) was harvested and, according to the district cultural resources specialist, was likely broadcast burned following the harvest. Pee Wee Gulch was mined for garnet gems from 1979 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream about 1,100 feet. Fence posts, old bridge planks and other remnants of the mining activity are still evident in the stream.

Flow/Hydrology: Flow at the culvert on Pee Wee Gulch was estimated to be approximately 0.03 cfs during March (PF: F-30).

Watershed Condition: Pee Wee Gulch has a moderate total road density (Table 10). Some riparian harvest occurred within this drainage; but it is an extremely minor amount, therefore the riparian area is considered to be in good condition.

Water Quality: No temperature data was collected on Pee Wee Gulch. Sources of potential sediment production include one stream crossing near the mouth and road along 1.4% of a stream course. Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: There are no migration barriers on Pee Wee Gulch, however the culvert under Forest Service Road 447 is likely undersized for the 100-year flood event.

Habitat Elements: Pee Wee Gulch is a small stream averaging 2.2 feet wide. The habitat is primarily fast water habitat (66%) with minor amounts of pool habitat (3%) and 2.1% of the stream went subsurface (Figure 10). About 29% of the stream was so densely overgrown with brush and forbs the surveyor was unable to determine habitat types within those sections. This stream had a very low amount of pool habitat as compared to the other small drainages within the project area, although the pools that did occur had similar physical attributes as those in similar sized drainages within the analysis area (Figure 9).

The stream banks along Pee Wee Gulch were primarily lined with brush and forbs which were very dense along some sections, thus indicating stable banks. Conifers occasionally occur within the riparian zone, but they are primarily located on the hill slopes. The valley bottom varies from 10 feet wide up to 30 feet wide. The width of the valley, therefore, dictates how much influence the conifers on the hill slope would have on the channel. The substrate at the lower end of the stream is primarily gravel and sands. Moving upstream the substrate increased in size with some fines present.

Summary: Pee Wee Gulch is primarily a spawning and early rearing stream. Limiting factors within Pee Wee Gulch include lower amounts of slow water habitats. The habitat of Pee Wee Gulch is considered to be adequate.

Flat Creek

Historic Activity: The stream survey conducted during 2002 found evidence of past mining activity. Timber harvest activity prior to 1933 treated approximately 20% of the lower portion of the drainage (review of 1933 aerial photographs). The district cultural resources specialist stated that the area was likely broadcast burned following the harvest. The Forest Archaeologist reported that a log chute was likely located in this drainage (PF: F-27). There has been no regulated garnet mining in this drainage.

Flow/Hydrology: No flow data is available for Flat Creek.

Watershed Condition: Flat Creek has extremely high total road density (Table 10). Some riparian harvest has occurred within this drainage, but the drainage is still considered to be in good condition (Table 10).

Water Quality: No temperature data was collected on Flat Creek. Sources of potential sediment production include: 14 stream crossings in the headwaters, one stream crossing near the mouth, roads along 11 percent of stream courses, and seven percent harvest of the riparian zone. Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: The fish-bearing portion of the stream has one culvert. This culvert passes under Forest Service Road 447. The culvert is not a migration bearer due to low gradient and substrate within the culvert. The culvert, however, is likely undersized for this drainage; and therefore, the substrate within the culvert reduces its capacity even further and increases the risk of failure.

Habitat Elements: A habitat survey was conducted in 2002 from the confluence with the East Fork of Emerald Creek upstream approximately 1,400 feet. The stream habitat is fairly evenly split between fast (57%) and slow (44%) habitats (Figure 10). Pool quality is fair, with residual pool depths being similar to some drainages of similar size but lower than some drainages of smaller size (Figure 9).

The majority of the woody debris within the channel is smaller sized (351 pc/1,000 feet). There are only two pieces of large woody debris per 1,000 feet of stream. This was the lowest amount of large woody debris for any of the surveyed streams.

The riparian zone appears to be healthy with areas of good canopy cover. Another indicator of riparian condition is that beaver activity is present in the drainage. Beaver utilize an area if there is sufficient riparian vegetation.

Summary: Flat Creek is a spawning and early rearing stream. There is limited information about temperature conditions, the physical habitat provides sufficient diversity although the quality of the pools might limit their usefulness. The culvert under Forest Service Road 447 is not currently a limiting factor, but it does present a high risk for failure and thus a potential for increasing sediment to the channel. Road densities are extremely high. The habitat of Flat Creek is considered to be moderately altered / at moderate risk.

Swamp Creek

Historic Activity: The stream survey conducted during 2002 found evidence of past mining activity. Timber harvest activity prior to 1933 treated approximately 30% of the lower portion of the drainage (review of 1933 aerial photographs). The district cultural resources specialist stated that the area was likely broadcast burned following the harvest. The Forest Archaeologist reported that a log chute was likely located in this drainage (PF: F-27). No regulated garnet mining has occurred in this drainage.

Flow/Hydrology: Discharge taken during the habitat survey of July 2002 ranged from 0.01 to 0.022 m/sec (PF: F-30).

Watershed Condition: Swamp Creek has extremely high total road density (Table 10). Some riparian harvest has occurred within this drainage, but the drainage is still considered to be in good condition.

Water Quality: Temperature data was collected in Swamp Creek in 2002; however, the recorder was not deployed until after the salmonid spring spawning period. The fall temperature criteria were exceeded during some days in the fall (PF: F-5). Sources of potential sediment production include: three stream crossings in the headwaters, one stream crossing near the mouth, roads long 2.7% of stream courses and ten percent harvest of the riparian zone. Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: The fish-bearing portion of the stream has one culvert. This culvert passes under Forest Service Road 447. The culvert is not a migration bearer due to the low gradient and substrate within the culvert. The culvert, however, is likely undersized for this drainage and, therefore, the substrate within the

culvert reduces its capacity even further and increases the risk of failure. In addition water is flowing under the culvert which can increase the risk of failure.

Habitat Elements: A quantitative habitat survey was conducted in 2002 from the confluence with the East Fork of Emerald Creek upstream for approximately one mile. Overall there was slightly more slow water habitat (57%) than fast water habitat (43%). Pool quality was lower than streams of similar size. Various segments of the stream went subsurface, but these were not quantified. Woody debris was present in both large (3 pc/1,000 feet) and small sizes (22 pc/1,000 feet). Total woody debris quantities were, however, lower in Swamp Creek than in some of the adjacent streams. Riparian vegetation consisted of dense understory. Stream banks were well vegetated and stable.

Summary: Swamp Creek is a spawning and early rearing stream. Although the temperature data is limited, it appears that temperature may be a limiting factor within this drainage. Habitat diversity is good but the quality of the pools may be limiting. The culvert under Road 447 is not currently a limiting factor, but it does present a high risk for failure and thus a potential for increasing sediment to the channel. Road density is extremely high for this drainage however the majority of the roads are located high on the ridges. The habitat of Swamp Creek is considered to be moderately altered / at moderate risk.

Post Creek

Historic Activity: Timber harvest activity prior to 1933 treated approximately 90 percent of the drainage (review of 1933 aerial photographs). The district cultural resources specialist stated that the area was likely broadcast burned following the timber harvest. The stream survey conducted during 2002 found evidence of the past activity including a railroad bridge, an old road, and stumps. The Forest Archaeologist further confirmed the level of activity in the drainage by stating that it is that likely a log chute was located in this drainage (PF: F-27). There has been no regulated garnet mining in this drainage.

Flow/Hydrology: No flow data is available for Post Creek.

Watershed Condition: Post Creek has a high total road density (Table 10). Some riparian harvest occurred within this drainage, but the drainage is still considered to be in good condition (Table 10).

Water Quality: No temperature data is available for Post Creek. Sources of potential sediment production include three stream crossings in the headwaters, one stream crossing near the mouth, roads encroaching on 2.3 percent of the stream course and eight percent harvest of the riparian zone. Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Access: There are two culverts on the fish bearing portion of Post Creek. These culverts are placed adjacent to each other under Forest Service Road 447, near the confluence with the East Fork of Emerald Creek. These culverts may be low flow migration barriers due to the division of the stream flow into the two pipes.

Habitat Elements: A quantitative habitat survey was conducted in 2002 from the confluence with the East Fork of Emerald Creek upstream for approximately one mile. Overall the majority of the habitat was fast water habitat (87%), and slow water habitat (pools) was only 12 percent (Figure 10). Pool quality, residual pool depth and volumes, was the highest for streams of similar size (Figure 9). There were 13 pc/1,000 feet of large woody debris and 98 pc/1,000 feet small woody debris. In some areas the quantities caused it to be difficult to see the channel. Riparian vegetation consisted of dense understory. Stream banks were well vegetated and stable.

Summary: Post Creek is a spawning and early rearing stream. The main limiting factor for fish production is the low diversity of habitats, and the culverts under Road 447 may be limiting. The habitat of Post Creek is considered to be adequate.

Highline Creek

Historic Activity: In the 1910s and 1920s a railroad line went up this stream system (Sims, personal communication). The 1930s aerial photos show logging activity in this drainage and the presence of a "logging camp". There has been no regulated garnet mining in this drainage.

Flow/Hydrology: No flow data is available for Highline Creek.

Watershed Condition: Highline Creek has extremely high total road density (Table 10). Some riparian harvest occurred within this drainage, but the drainage is still considered to be in good condition (Table 10).

Water Quality: No temperature data is available for Highline Creek. Sources of potential sediment production include four stream crossings in the headwaters, roads long nine percent of stream courses and 11 percent harvest of the riparian zone. Chemical contamination and nutrient levels are expected to be similar to reference conditions because of the low potential for chemical introduction (minimal number of road/stream intersections and low use of those roads), the lack of agricultural activity and the lack of grazing.

Habitat Elements: A quantitative habitat survey was conducted in 2002 from the confluence with the East Fork of Emerald Creek upstream for approximately 2,000 feet. Overall the majority of the habitat was fast water habitat (91%) and slow water habitat (pools) was only eight percent (Figure 10). Pool quality, residual pool depth and volumes, was similar or lower than in streams of similar size (Figure 9). Woody debris densities were lower than in some adjacent streams. Large woody debris quantities were 15 pieces/1,000 feet and small woody debris were 70 pieces/1,000 feet. Some of the logs were cut logs. Riparian vegetation was dense in some areas, but the presence of Road 1489 on the eastern side of the stream reduces the amount of riparian vegetation and the potential for woody debris recruitment.

Summary: Highline Creek is a spawning and early rearing stream. The main limiting factor for fish production is the low diversity of habitats, the streamside road, and extremely high road densities. The habitat of Highline Creek is considered to be moderately altered / at moderate risk.

Little East Fork Emerald

Historic Activity: A review of historic aerial photographs (1933) indicates that timber harvest prior to 1933 occurred on approximately 25 percent of the drainage. A railroad system was constructed up this drainage to facilitate the removal of the timber. Parts of the old railroad system remain evident in the stream today. There has been no regulated garnet mining in this drainage.

Flow/Hydrology: No flow data is available for Little East Fork Emerald.

Watershed Condition: Little East Fork Emerald has extremely high total road density (Table 10). A moderate amount of riparian harvest occurred within this drainage (Table 10).

Water Quality: Temperature data was collected one year in Little East Fork Emerald Creek. Temperatures were shown to exceed Idaho State criteria on 29 days (Figure 8). Sources of potential sediment production include 30 stream crossings in the headwaters, roads along 9.4% of the stream course and 18 percent harvest of the riparian zone. Chemical contamination and nutrient levels are expected to be similar to reference conditions. This is due to the low potential for chemical introduction (although there are several road/stream intersections the use on these roads is low), the lack of agricultural activity and the lack of grazing.

Habitat Elements: In 2001 the Forest Service conducted a quantitative survey on approximately the lower two miles of stream. This review divided the channel into four reaches based on channel form, valley bottom, gradient and substrate. The habitat has equal amounts of run and pool habitat. The next most common type is braided habitat. The variety of habitat indicates good diversity for this stream (Figure 10). Currently the stream likely has more pools in the lower section than were present at the time of the survey because beaver since moved into the system and built dams which create more pool habitat. Pool habitat in general appears to be of fair quality based on residual pool volume (maximum) and residual pool volume (mean), although residual pool depth is small and is similar to much smaller drainages (Figure 9). The riparian zone consists primarily of brush at the lower end of the stream.

Summary: Little East Fork Emerald Creek is a spawning and rearing stream. The main limiting factors to fish production are higher stream temperatures, extremely high road densities and fair residual pool depth. The habitat of Little East Fork Emerald Creek is considered to be moderately altered / at moderate risk.

East Fork Emerald

Historic Activity: Mining and timber activity have had a long-term and influential impact on the fish habitat of this drainage, starting as early as the 1860s. Other impacts to the stream include grazing, railroad construction and recreational activities. These activities changed fish habitat and channel stability by channelizing and relocating sections of stream (1 ½ miles of stream), removing in-stream woody debris, and removing overhead cover. Anecdotal reports state that garnet mining began in the East Fork of Emerald Creek in the mid-40s. This early mining occurred on the lower approximately 2.5 miles of stream.

Various projects have been conducted within the East Fork Emerald Creek drainage to improve instream and riparian conditions. Some woody debris is being added to the stream as pieces of the old railroad deteriorate and collapse into the channel. The Forest Service added large woody debris (109 pieces) to East Fork Emerald Creek to increase the diversity of fish habitat. Trees and shrubs were planted along different segments of stream in 1992, 2001, 2002, and 2005. Sediment reduction projects include six miles of road obliteration, and 11 miles of resurfacing of Road 447. A 15-acre cattle exclosure was constructed around the stream in 2000-2001.

Flow/Hydrology: Estimates of the discharge for the two-year peak flow ranged between 247 and 324 cfs depending on the estimation method utilized (Watershed Report).

Watershed Condition: East Fork Emerald has a high total road density (Table 10). Some riparian harvest associated with timber sales has occurred within this drainage, but the greatest source of riparian harvest was due to the construction of the railroad. Two parking areas are located within the RHCA along East Fork Emerald Creek, between 281 Gulch (approximately 0.47 acres) and Pee Wee Gulch (approximately 0.85 acres). These parking areas are graveled and the 281 parking lot has an outhouse adjacent to it. The riparian condition is considered to be in poor condition due to the combination of these activities.

Water Quality: Temperature data was collected for four years (Figure 8). During three years temperatures, on some days, exceeded the Idaho State spring Salmonid spawning temperature criteria. The number of days of exceedance ranged from 29 to 45 days. During 2002, the year which did not show an exceedance, the temperature recorder was not deployed until after the spring salmonid spawning period. The state of Idaho has developed a Total Maximum Daily Load (TMDL) for temperature for the East Fork (ID DEQ, 2003 p. 91). See the Water section in this chapter for more discussion on the temperature TMDL. Sources of potential sediment production include: 20 culvert stream crossings, three bridges, roads along 12.1% of stream courses and ten percent harvest of the riparian zone. There is a very low risk of chemical contamination of the stream. This risk is primarily associated to vehicles traveling along the streamside road. Nutrient levels may be slightly higher than reference conditions due to cattle use within the lower portion of the drainage. A cattle exclosure is located around the stream approximately 2.5 miles upstream for the mouth of the stream.

Habitat Elements: Fish habitat was surveyed in the lower four miles of the East Fork up to the confluence with the Little East Fork Emerald in 1992 and again in 2001 (PF: F-1). The 1992 survey determined that 43 percent of the surveyed stream length was pool habitat, 37 percent was riffle/run habitat, and 20 percent was glide habitat. The 2001 survey reports habitats are essentially the same as the 1992 survey. The minor difference could be a result of surveyor bias or due to the lower water levels during the 2001 survey. The 2001 survey reports 53 percent slow water habitats and 47 percent fast water habitats (Figure 10). These percentages describe a stream with fairly good diversity of habitat, although only Reach 9 meets the INFS riparian management objective (RMO) for pool frequency. Pool habitat is fairly well represented; however, the quality of the pool habitat was low. The lack of quality pools is related to the shallowness and lack of cover (seven percent) and especially lack of wood debris cover (two percent) based on 1992 surveys. In-stream cover in the summer is greater due to the amount of aquatic vegetation. This type of cover is not as useful as woody debris because it does not persist through the winter and does not provide the complexity of woody debris. The potential for large woody debris recruitment to the stream is low due to the limited

amount of riparian trees. The upper portion of East Fork, upstream of Little East Fork, is primarily runs and pools. Beaver activity is common in this section and is creating pools and slack water areas. Upstream of the East Fork Emerald and Pee Wee Creek confluence, the East Fork valley bottom narrows and has a coniferous riparian zone.

Summary: East Fork Emerald Creek is a spawning and rearing stream, with added importance as an over-wintering area. The limiting factors for fish production are high stream temperatures, high road density, streamside road, and low complexity of habitat. The habitat of East Fork Emerald Creek is considered to be moderately altered / at moderate risk.

Summary of Cumulative Effects Area Streams

In general none of the streams of the cumulative effects area are in pristine condition (Table 11). They all are recovering from activity (timber harvest, railroads, mining) which occurred in the late 1800s and early 1900s. Trees are growing and riparian canopy has increased by 50 percent when comparing 2002 conditions to conditions in 1969 (Macy, 404 channel permit 2005).

Table 11 - Current Status of Streams

281 Gulch			X	
Garnet Gulch		X		
No Name Gulch			X	
Pee Wee Gulch		X		
Flat Creek			X	
Swamp Creek			X	
Post Creek		X		
Highline Creek			X	
Little East Fork Emerald			X	
East Fork Emerald			X	

Eight of the streams, because of small size and limited flow, are considered to provide limited amounts of spawning and early rearing habitat. The remaining two streams are larger and provide spawning, rearing and important over-wintering habitat. Of the smaller eight streams, two (Pee Wee Gulch and No Name Gulch) were impacted in the past by organized recreational garnet digging, one (281 Gulch) currently has recreational garnet collecting and one (Garnet Gulch) has had past unauthorized digging and some authorized testing. Habitat diversity within the smaller, early rearing streams has dominant habitat types that range from 46-91 percent of the stream habitat. Streams which have been previously mined have similar or higher percentages of fast water habitat as some of the unmined streams. Woody debris data was not collected on all the streams but quantities of surveyed streams ranged between 77-91 percent of all wood being small-sized, and large woody debris ranging between 1-17 percent. Temperature data in all streams, where data was collected, indicate days which exceeded Idaho State temperature standards for salmonid spring spawning.

Environmental Consequences

Analysis Methodology

This project proposes direct activity within the 281 Gulch, Garnet Gulch and East Fork Emerald Creek. The current limiting factors for these streams are identified in Table 12.

Table 12 - Limiting Factor Identification

High temperatures	X	X	X
High road density	X	X	X
Habitat Elements (simplified habitat)	X		X
Habitat access	X	X	X

Project Issue Indicator Determination

The project issue indicators were selected based on consideration of public comments, the determination of the limiting factors, the need to achieve the desired condition for fish habitat, and the potential for effects from the proposed project. The proposed activities include recreational garnet mining, culvert replacement, road construction, road decommissioning, trail construction, rehabilitation of previously mined areas, and rehabilitation of floodplains in the East Fork of Emerald Creek. These activities have the potential to create various impacts to population characteristics, riparian vegetation, stream channel characteristics, stream flow, in-stream habitat conditions, chemical contamination, sediment, temperature, migration barriers and road densities. These factors when combined can cause an impact to the quality and quantity of fish habitat. The following table identifies those issues selected as project issue indicators.

Direct and Indirect Effects

Direct and indirect effects analysis considers how the proposed action would affect the project issue indicators within the individual drainages. Analysis of effects to some of the issue indicators is addressed through design features, and therefore, are the same for all alternatives. Some effects would vary for the issue indicator depending on the alternative. Due to the interconnectedness of measurement parameters several were combined and are addressed under a single comprehensive issue indicator.

Population Characteristics

Effects to population characteristics will be displayed in the Biological Evaluation table and the Biological Assessment document.

Project Issue Indicators

% RHCA Vegetation Disturbance: This issue is a combination of two measurement parameters because they are affected by the project in similar ways: Riparian Harvest and Stream Temperature. This issue is presented for each alternative because of the variation in the alternatives.

> *Riparian Harvest:* The analysis is based on the location of mining panels and the percentage of the RHCA which is affected.
>
> *Stream Temperature:* The analysis is based on amount of proposed riparian vegetation (trees and shrubs) removal within the riparian habitat conservation areas. Cutting trees can have negative effects to stream temperatures by reducing canopy and thus exposing channels to solar radiation (Chamberlin et al 1991).

Table 13 - Selection of Project Issue Indicators

Population Characteristics	Population Size	Yes	Determination presented in BA/BE
	Growth and Survival	Yes	Determination presented in BA/BE
	Diversity	No	No
	Isolation	No	No
	Fish Persistence	Yes	Determination presented in BA/BE
Stream Channel Conditions	Width to Depth Ratio	Yes	% of fish-bearing channel altered annually
	Streambank Condition	Yes	% of fish bearing channel altered annually
	Floodplain Connectivity	Yes	% of fish-bearing channel altered annually
Flow/hydrology	Change in Peak/Base Flows	Yes	Design Feature, effects common to all alternatives
Watershed Condition	Sensitive Landtypes	No	No
	Road Density	Yes	Road Density
	Riparian Harvest	Yes	% RHCA vegetation disturbed
	Elevation	No	No
Water Quality	Temperature	Yes	% RHCA vegetation disturbed
	Sediment	Yes	% of fish-bearing channel altered annually
	Chemical Contamination/nutrients	Yes	Design Feature, effects common to all alternatives
Habitat Access	Physical Barriers	Yes	Design Feature, effects common to all alternatives
Habitat Elements	Substrate Embeddedness	Yes	% of fish-bearing channel altered annually
	Large Woody Debris	Yes	% of fish-bearing channel altered annually
	Pool Frequency	Yes	% of fish-bearing channel altered annually
	Large Pools	Yes	% of fish-bearing channel altered annually
	Off-Channel Habitat	No	No
	Refugia	No	No

% Fish-Bearing Channel Alteration Annually: This issue is a combination of three indicators which are each comprised of several measurement parameters: Stream Channel Conditions, Habitat Elements, Water Quality. These indicators were combined into one issue indicator because changes to them could affect fish habitat. This issue indicator is presented for each alternative because of the variation which could occur under each alternative.

Stream Channel Conditions: The project proposal has the potential to influence the three measurement parameters of Width to Depth Ratio, Streambank Conditions and Floodplain connectivity. Changes to these parameters can degrade the fish habitat. Wider, shallower streams have less available useable habitat and can increase water temperatures. Changes to streambank conditions can reduce undercut banks, increase sediment into the channel which can fill in pool habitat. The changes to floodplain connectivity can increase velocities within the channels which can cause erosion of streambanks.

Habitat Elements: All the measurement parameters associated with this issue can affect fish habitat.

Water Quality: The measurement parameter of sediment is combined under this issue indicator because increases in sediment can fill pool habitat thus altering (degrading) fish habitat.

% Fish-Bearing Channel Alteration Cumulatively: This issue indicator takes into consideration the effects over the life of the project.

Road Density: This analysis reviews the change to road density within the drainage and is different for different alternatives. The determination of road density effects on fish is based on research conducted for the ICBEMP (Lee et al 1997). This research determined that high and moderate road densities (see Table 5) are considered to reduce the use of streams by non-anadromous fish. Streamside roads are likely to be the most impactive road segments (Dose and Roper 1994). Therefore the higher the amount of streamside road left in a drainage, the higher the risk for degrading in-stream habitat.

Issue Indicators Addressed with Design Features

Flow/hydrology: This project proposes to remove stream flow from the channel. Stream flow influences in-stream habitat by influencing the amount of available spawning and rearing habitat. A design feature was developed to address this issue, and therefore, the analysis is presented under features common to all alternatives.

Chemical Contamination: This project proposes using gas-powered pumps, therefore, there is a potential for chemical contamination to the stream. A design feature was developed to address this issue, and therefore, the analysis is presented under features common to all alternatives.

Habitat Access:

Physical Barriers: Currently physical barriers to fish migration exist within the analysis area. A design feature was developed which would correct migration barriers, and therefore, the analysis is presented under features common to all alternatives.

Cumulative Effects

The cumulative effects area for this project is the East Fork of Emerald Creek. This area was selected because it includes all potential activity and is a scale which will not mask effects of the activity.

The cumulative effects analysis takes into consideration:

- Past activity: described under the heading Historical Influences, in the Affected Environment section of this document.
- Current conditions: described previously in this chapter.
- Future foreseeable actions utilized in this analysis are listed at the beginning of Chapter 3 of this EIS and the effects are described in Table 10.

- Non-Forest Service managed activity includes timber harvest and road construction on Potlatch Corporation lands and cattle grazing.
- Information about the proposed action comes from the descriptions provided in the Garnet EIS and the descriptions of the direct / indirect effects of the individual drainages.
- Cumulative effects are described for East Fork Emerald Creek, which was selected as the cumulative effects area.

Effects Analysis

Effects Common to All Alternatives

Table 14 lists the current and reasonably foreseeable activities, which are common to the No-Action Alternative and the action alternatives. Some of these activities are Forest Service authorized activities; others are general uses which do not require specific authorization. This table provides a summary of the direct and indirect effects from the individual activities. These activities and their effects were taken into consideration during the cumulative effects analysis.

Direct/Indirect Effects

Fish Persistence: Fish would be captured using electrofishing equipment and would be relocated downstream prior to excavation of stream channel panels (Design Feature C.6.). The potential exists for some mortality associated to this relocation, but this procedure should be less impactive than allowing fish to remain during channel relocation. Fish screens would be utilized on all water intake equipment to prevent entrapment (Design Feature F.3.e.).

% Fish-Bearing Channel Alteration Annually: 281 Gulch would be altered during the mining of the panels, which include the stream channels. Annually, approximately 150 feet of stream could be disturbed, this is approximately three percent of the fish-bearing stream length of 281 Gulch. In some years the excavation would not occur within the channel.

The mining of the panels within the channel involves the construction of a diversion channel, diversion of flow from the existing channel to the diversion channel, the mining of the original channel location, the reconstruction of the channel and the return of the water to its original channel location. The excavation sites would be kept as dry as possible by use of interception trenches or other methods (Design Feature M.10.). Water from the excavation sites would not be discharged into active waters (Design Feature M.11.). Measurements of the existing channel have been collected, and following the mining the channel would be returned to that configuration. In-stream habitat diversity would be created within the new channel. Woody debris would be incorporated into the new channel to provide habitat complexity and dissipation of flow energy. Streambanks would be developed using bioengineering methods. Vegetation that was removed prior to mining would be replanted, and additional plantings of native and desirable non-native species would occur. The area would also be mulched. These reconstruction efforts should reduce the amount of sediment put into suspension when the water is returned to the original location and should aid in the rapid reestablishment of stable banks. The diversity of habitat can be returned to the existing composition; however, the quality of the in-stream habitat would be reduced until the channel stabilizes and vegetation becomes established.

The settling and holding ponds would be developed outside of the floodplain but within the RHCA. The spoils which are periodically extracted from the settling pond would be stockpiled and used later during reclamation. Sediment transport from these sites is unlikely due to the use of sediment filters between the sites and the stream.

Rehabilitation of previously mined areas in Pee Wee, No Name and 281 Gulches would increase the diversity of habitat within those drainages. There is a potential for minor amounts of sediment becoming suspended during the in-stream activity, but this would be temporary.

Table 14 - Summary of Effects of Current and Reasonable Foreseeable Actions

Dispersed Camping	Alteration of streambanks and increased nutrient loading	Minimal	St. Joe River/NF Clearwater Basins BA, July 1998
Outfitter and Guides	Primarily associated with effects of camping & stock use	Minimal	Outfitter Guide Programmatic BA, 2004 (project file)
Garnet Digging Outfitter	Same as associated to general public operation	See effects common to all alts	Effects analysis for this document
Bechtel Butte Garnet lease and prospecting	Activity is on the ridge top	No effects	Bechtel Butte Mineral App BA, 2003
Fire Suppression	Reduced shading due to hazard tree felling in RHCA; Chemical contamination	Minimal based on implementing INFS Guidelines.	St.Joe River/NF Clearwater Basins BA, July, 1998
Gathering of misc. forest products	Primarily due to influence of roads	Minimal based on implementing INFS guidelines	Programmatic Road Maint. BA, 2004 Determination: May affect, not likely to adversely affect.
Control of Noxious Weeds	Potential for chemical contamination	No Effect	St. Joe Noxious Weeds EIS, 10/1999
Road Maintenance	Increased sediment, temp & chemical contamination; decreased LWD	Yes	Programmatic Road Maint. BA, 2004 Bull Trout Determination: May affect, not likely to adversely affect.
Biotic Factors	Further expansion of brook trout or rainbow trout	Minimal	Influenced by habitat conditions (Shepard 2004).
Data Gathering		No effect	No ground-disturbing activity
Firewood cutting	Potential for reduction in LWD recruitment	Minimal	Firewood permit specifies no firewood cutting within 300 feet of a stream.
Cattle Grazing	Potential for increased sedimentation, nutrients and temperature. Specific to this project is the potential to damage restoration efforts.	Yes	SM Grazing Allotments BA, June 2000 Bull Trout Determination: May affect, not likely to adversely affect. The potential for damage to restoration efforts addressed in a design feature.
Timber stand improvement (tree pruning & planting, precommercial thinning, gopher baiting, fertilizing)	Potential for chemical contamination from gopher baiting.	Minimal	Pocket Gopher Control BA, 2002. Bull Trout Determination: May affect, not likely to adversely affect.
	Tree pruning, precommercial thinning tree planting	No Effect	No ground disturbing activity, canopy cover maintained or increased.
Trail Maintenance	Increased sediment, temp & chemical contamination; decreased LWD	Miminal	Programmatic Road Maint. BA, 2004 Bull Trout Determination: May affect, not likely to adversely affect.
St. Maries River Basin Fuels Reduction Area 2 Emerald Creek CG	Potential for increased sedimentation, water yield or effect to stream habitat.	Minimal	SM River Basin Fuels Reduction Area 2 Emerald Creek CG BA draft 2005. Bull Trout Determination: May affect, not likely to adversely affect.
Emerald City Timber Sale	Low potential for sediment or water yield increases, or effect to stream habitat.	Minimal	Emerald City BA, 2005. Bull Trout Determination: May affect, not likely to adversely affect.
Emerald Butte Access DM	Sedimentation	None	Potlatch Access – Emerald Butte BA 2005. Bull trout Determination: No Effect
Unauthorized garnet digging	Sedimentation, loss of habitat,	Minimal	Law enforcement and posting area as “No Digging” should reduce potential

% RHCA Vegetation Disturbance: Annually between 0.2 and 0.4 acres of RHCA would be affected to allow mining of the garnet-bearing gravels. This amount of mining would shift downstream yearly. The sites would be replanted immediately with grasses, forbs, brush and trees. These plantings would reduce the potential for sediment input from overland flow. It is estimated that it would take approximately three years for riparian vegetation to become reestablished (DiGiacomo, pers. com.). In addition to this annual effect there would be one acre of disturbance within 281 Gulch for the overburden and garnet-bearing gravels stockpiles, the sluice and the settling pond. There would be sediment control features between these sites and the stream which would reduce the potential for sediment introduction to the channel. The effects of disturbance to the riparian zone is expected to have a minor influence on temperature because of the orientation of the drainage, topography, and the minor amount of length of stream affected.

Auger testing within the RHCA would cause very minor disturbance of small areas that are proposed for mining and would be rehabilitated quickly (Design Feature M.2.), thus preventing transport of sediment to the channel.

Temporary access trails would be created to transport the gravel bearing soil to the stockpile area. These would be short trails which would be treated with various methods to reduce the potential for sediment movement (Design Feature F.2.i); therefore, this should not increase sediment to the channel.

Any trees removed during site preparation for this proposal would be retained for use during restoration to further reduce the potential for sediment transport to the stream.

Restoration work within 281 Gulch would include about 1,200 feet of riparian planting along areas which were previously mined in the East and West Fork. This activity would stabilize streambanks, reduce potential for overland sediment flow entering the channel, and in the long term would produce shading for the stream and future woody debris recruitment.

Flow/hydrology: Design Feature (M.12.) was developed to maintain sufficient flows to provide similar flow conditions as what currently exists.

Road Density: The removal of Road 3781 (0.35 miles) would reduce road density in 281 Gulch from 4.4 mi/mi^2 to 3.8 mi/mi^2. This density is still considered to be in the high range.

Chemical Contamination: The likelihood of chemical contamination is very low due to the implementation of design features (Design Feature D.2.) to control hazardous materials. In case of an accident emergency procedures have been developed to ensure quick response to the situation (Design Feature D.3.).

Habitat Access: All culverts which are migration barriers or causing hydrologic concerns would be replaced under all alternatives. The replacement of the existing culverts has the potential to cause temporary increases in sedimentation and turbidity, modification to the hydrology, temporary loss of riparian vegetation, streambank alteration, and long-term improvement to fish passage and habitat access. Negative effects should be minimal due to implementation of BMPs and would be short term. Positive effects would be long-term improvement to fish migration. If the culverts are not replaced and they fail there is a high risk of increasing sediment to the channel for long periods of time until it is repaired.

Alternative A

All activity proposed in Alternative A would also occur in Alternatives B and C with one exception. In Alternative A the majority of the space occupied by the parking lots (281 Gulch and Pee Wee parking areas), along the East Fork of Emerald Creek, would be removed allowing for the reestablishment of part of the floodplain. A minor amount of the parking area would be retained as a turnout. The effects for all activities proposed under this alternative are presented in the section titled “Effects Common to All Alternatives” except the parking lot effects which follow. Alternatives B and C have additional activities which are not proposed for Alternative A.

Direct/Indirect

% RHCA Vegetation Disturbance: Riparian vegetation would become reestablished along East Fork of Emerald Creek when the parking lots are removed. The area of disturbance would change from 1.3 acres to 0.5 acres. This would improve sediment filtration between Road 447 and the East Fork of Emerald Creek. In addition, planting of conifers within the area, previously occupied by parking lots, would eventually grow and provide shade to the stream as well as future woody debris recruitment.

Cumulative Effects – 281 Gulch

% Fish-Bearing Channel Alteration Cumulatively: Over the life of the project 600 feet, (14%) of 281 Gulch fish-bearing water would be affected. When this is combined with the area which was previously dug the total percentage of alteration is 53% of the fish-bearing section of 281 Gulch. The segment of 281 Gulch which would be altered under this alternative would be reclaimed immediately following disturbance thus reducing the time that the stream is altered. The restoration effort of previously dug areas will increase the rate at which that section is stabilized.

% of RHCA Vegetation Disturbance: There are approximately 89 acres of RHCA within 281 Gulch. This alternative proposes to alter an average of 0.3 acres annually, which over a period of potentially four years (at most) equates to 1.2 acres of disturbance of the term of the project. Previous mining activity disturbed approximately three acres (combined in the East and West Forks of 218). The combination of past and proposed RHCA disturbance equals approximately five percent of the RHCA vegetation of 281 Gulch. Approximately 80% of the past activity has received various amounts of riparian planting and currently has complete ground cover; however, trees are still not large enough to provide shading.

Cumulative Effects – East Fork Emerald Creek

% Fish-Bearing Channel Alteration Cumulatively: Several design features were developed to reduce the potential for sediment transport to East Fork Emerald from the proposed mining activity, thus greatly reducing the potential for impacts to fish habitat within the East Fork. The proposed alteration of habitat combined with past alteration within 281 Gulch, a spawning and rearing stream, would create a nine percent alteration to spawning and rearing habitat within the East Fork of Emerald Drainage and five percent alteration of any type of fish-bearing waters within the East Fork Emerald Creek Drainage.

Effects Common to Alternatives B and C

All activities that are proposed under Alternative B would also occur under Alternative C with the only exception being the size of the parking area at the Garnet Gulch collection site. Under Alternative B the parking area would be one acre and under Alternative C it would be three acres. Because the parking areas would be located in the same area and because the sizes are so similar the effects are anticipated to be the same. Effects common to both of these alternatives was presented in the section titled “Effects Common to All Alternatives”.

Direct/Indirect Effects

% Fish-Bearing Channel Alteration Annually: Garnet Gulch would be altered during the mining of the panels which include the stream channels. Annually approximately 150 feet of stream could be disturbed, this is approximately four percent of the fish-bearing stream length of Garnet Gulch. In some years there would not be excavation within the channel because it would occur on the bench outside of the riparian area.

The mining of the stream channel panels would involve the construction of a diversion channel, diversion of flow from the existing channel to the diversion channel, mining of the original channel location, reconstruction of the channel and return of the water to its original channel location. Measurements of the existing channel were collected, and following the mining the channel would be returned to that configuration. In-stream

habitat diversity would be created within the new channel. Woody debris would be incorporated into the new channel to provide habitat complexity and dissipation of flow energy. Streambanks would be developed using bioengineering methods. Vegetation removed prior to mining would be replanted, and additional native and desirable non-native species would be planted. The area would also be mulched.

These reconstruction efforts should reduce the amount of sediment put into suspension when the water is returned to the original location and should aid in the rapid reestablishment of stable banks. The diversity of habitat can be returned to the existing composition; however, the quality of the in-stream habitat would be reduced until the channel stabilizes and vegetation becomes established.

% RHCA Vegetation Disturbance: Annually between 0.2 and 0.4 acres of RHCA would be affected to allow mining of the garnet-bearing gravels. This amount of excavation would shift downstream yearly. The sites would be replanted immediately with grasses, forbs, brush and trees. It is estimated that it would take approximately three years for riparian vegetation to become reestablished. In addition to this annual effect, in Garnet Gulch, there would be at most three acres of sustained disturbance within the RHCA for the overburden stockpiles and operations area. The parking area is not within the RHCA therefore there would be no direct effects for the construction of this parking area or the use of the area.

Any trees removed during site preparation for this proposal would be retained for use during restoration to further reduce the potential for sediment transport to the stream.

Riparian vegetation would become reestablished along East Fork of Emerald Creek when the parking lot at Pee Wee Gulch is removed. This would improve sediment filtration between Road 447 and the East Fork of Emerald Creek. In addition, conifers planted within the area previously occupied by parking lot would eventually grow and provide shade to the stream as well as future potential woody debris recruitment.

Flow/hydrology: Design Feature M.12. was developed to maintain sufficient flows to provide similar flow conditions as what currently exists. The loss of canopy cover associated with the construction of the parking areas could potentially cause an increase in water yields, however because of the small size of the area (one to three acres) no affects are anticipated (see Watershed section). Loss of canopy associated with the removal of panels is not anticipated to cause a change to water yields (see Watershed section).

Road Density: Road density would increase in Garnet Gulch from 3.9 mi/mi^2 to 4.6 mi/mi^2. This density would maintain the drainage in the high density category. A small portion of the new road is in the East Fork Emerald Creek drainage, but it is so small that there would be no change to total road density.

Cumulative Effects - 281 Gulch

% Fish-Bearing Channel Alteration Cumulatively: Over the life of the project 600 feet, (14%) of 281 Gulch fish-bearing water would be affected. When this is combined with the area which was previously dug the percentage of alteration would be 53% of the fish-bearing section of 281 Gulch. The segment of 281 Gulch which would be altered under these alternatives would be reclaimed immediately following disturbance thus reducing the time that the stream is altered. The restoration effort of previously dug areas will increase the rate at which that section is stabilized.

% of RHCA Vegetation Disturbance: There are approximately 89 acres of RHCA within 281 Gulch. This alternative proposes to alter an average of 0.3 acres annually, which over a period of potentially four years (at most) equates to 1.2 acres of disturbance of the term of the project. Previous mining activity disturbed approximately three acres (combined in the East and West Forks of 218). The combination of past and proposed RHCA disturbance equals approximately five percent of the RHCA vegetation of 281 Gulch. Approximately 80% of the past activity has received various amounts of riparian planting and currently has complete ground cover; however, trees are still not large enough to provide shading.

Cumulative Effects - Garnet Gulch

% Fish-Bearing Channel Alteration Cumulatively: Over the life of the project 1,700 feet (40%) of Garnet Gulch fish-bearing water would be affected. The segment of Garnet Gulch which would be altered would be reclaimed immediately following disturbance thus reducing the time that the stream is altered. There are

approximately 85 acres of RHCA within Garnet Gulch. Over the life of the project about eight percent of the RHCA vegetation of Garnet Gulch would be disturbed for this project.

Cumulative Effects - East Fork Emerald Creek

% Fish-Bearing Channel Alteration Cumulatively: Several design features were developed to reduce the potential for sediment transport to East Fork Emerald which would greatly reducing the potential for impacts to fish habitat within the East Fork. Cumulatively there would be disturbance to 15 percent of the spawning and early rearing stream habitat of the East Fork Emerald Creek Drainage and five percent alteration of any type of fish-bearing waters within the East Fork Emerald Creek Drainage.

Table 15 - Comparison of Alternatives by Stream by Issue Indicator

	Alt A	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**	**Alt A**	**Alt B**	**Alt C**
% RHCA Vegetation Disturbance	3	3	3	0	8	8	n/a	n/a	n/a
% Fish-Bearing Channel Alteration Annually	3	3	3	0	4	4	n/a	n/a	n/a
Cumulative % Fish-Bearing Channel Alteration (from recent and future mining)	53	53	53	0	40	40	3	5	5
Road Density	3.8	3.8	3.8	3.9	4.6	4.6	3.9	3.9	3.9

Sensitive Species Biological Evaluation

Table 16 - Summary of Conclusion of Effects

1. Westslope Cutthroat Trout	MIIH*	MIIH	MIIH

**MIIH means May Impact Individuals Or Habitat,but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.*

Compliance with Standards and Laws

Compliance with IPNF Forest Plan and INFS Guidelines

Standard 2 does not apply to this project because none of the streams identified in that standard are located in this project area.

Standard 3 does not apply to this project because none of the streams identified in that standard are located in this project area.

Standard 4 would be met. No new road construction would cross a fish-bearing stream. Current migration barriers would be corrected.

Standard 5 was met. The information contained in this report uses fisheries surveys to coordinate activities with other resources.

Standard 6 was met due to the extensive review of the stream systems and the implementation of standards described in INFS.

Compliance with INFS Standards

The implementation of the alternatives would comply with INFS standards (PF: F-38).

Compliance with NFMA Regulations

The alternatives would meet NFMA requirements by complying with Forest Plan direction.

Compliance with ESA Regulations

The alternatives would not jeopardize the continued existence of bull trout, the listed species that historically was found in the project area. A biological assessment was completed for the preferred alternative (PF: F-48). It was reviewed by the U. S. Fish and Wildlife Service, and they concurred with the findings in the biological assessment (PF: F-50).

Compliance with Executive Order 12962

The alternatives would maintain habitat and thus would not affect the fishery potential, which in turn would not reduce the potential for recreational fishing opportunities.

HERITAGE RESOURCES

Regulatory Framework

In accordance with the National Historic Preservation Act of 1966, as amended, this documents the procedures used in identifying and evaluating heritage resources within the project area. The Idaho Panhandle National Forests (IPNF) Forest Plan requires systematic heritage resource inventory prior to ground disturbing activities and the preservation of significant heritage resources in place whenever possible. The IPNF Forest Plan also requires consultation with the State Historic Preservation Officer to determine significance of historic properties. This site evaluation process is outlined in the Programmatic Agreement among the United States Department of Agriculture, Forest Service, Northern Region, The Advisory Council on Historic Preservation and, the Idaho State Historic Preservation Officer regarding Cultural Resources Management on Region 1 National Forests in the State of Idaho. This includes consultation with Native American groups to determine if sites of religious or cultural significance are in the area.

Geographic Scope of Analysis

The analysis area for heritage resources is the project area of the Emerald Creek Garnet Area project. The project area has been systematically surveyed for heritage resources through one previously proposed project. Two areas in the Emerald Creek Garnet Area project were reexamined for the current project based on information in the original survey. These surveys have been documented and recorded in past and current inventory reports. In addition to field surveys, historic records, maps and photos were reviewed for confirmation of known sites and to possibly identify new sites. Site information is exempt from mandatory disclosure pursuant to the Freedom of Information Act, 5 USC 552(b)(5). Additional surveys for any newly discovered sites would be documented in accordance with established Forest procedures. There has been adequate inventory coverage on all potential impact areas within the project area.

Affected Environment

Heritage properties identified within the project area date to the historic period and are related to the historic contexts of logging history. The historic use of the area was mostly logging and related activities in the 1920s as well as the relatively recent activities related to garnet digging.

Environmental Consequences

Alternatives A, B and C

Alternatives A, B and C include stream restoration, recreational garnet removal, mechanical removal of top soil, excavation of garnet gravels, trail reconstruction, and road reconstruction. All ground-disturbing activities can potentially affect heritage resources. The preferred method for conservation of these resources is avoidance, and this is planned for the action alternative. A project is considered to have an adverse effect when the effect diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling or association. An analysis of Alternatives A, B and C show they will have No Effect to significant heritage resources

There is potential for finding additional sites during project implementation. If additional sites are discovered, the sites would be inventoried and then protected if found to be of historic significance. The decision to avoid, protect or mitigate impacts to these sites would be in accordance with the National Historic Preservation Act. With site avoidance being the method to preserve heritage resources the Alternatives A, B & C are basically the same as no action in terms of effects to the heritage resource. There are no expected direct, indirect or cumulative effects to significant heritage resources with implementation of either alternative. No potentially significant effects have been identified.

Consistency with the Forest Plan and Laws

Systematic inventory and reports are complete for this project area, and the Idaho Historic Preservation Office and Native American groups have been given the opportunity to comment. The proposed action was discussed with representatives of the Coeur d'Alene Tribe during a meeting on March 21, 2005. The alternatives comply with the National Historic Preservation Act and the IPNF Forest Plan.

MINERALS AND GEOLOGY

Regulatory Framework

There are a large number of laws relating to mining on public lands, but the relevance to this discussion is limited since the garnet site is operated principally as a recreational site. The primary laws and regulations that are pertinent cover the disposal authority for the mineral resource, and state and federal environmental regulations applicable to mining operations. Additional direction, goals, objectives, standards, and guidelines for management of mineral resources are also provided in the Idaho Panhandle National Forests, Forest Plan (1987).

The majority of the lands within the study area were acquired in the 1960s and 1970s by the USFS through land donations or land exchanges for the purposes of land consolidation and to some extent to provide for public garnet collecting and related recreational activities. These acquired lands are not open to mineral entry and location under the 1872 General Mining Laws as are most other USFS system lands because of their manner of acquisition. However, the minerals on these acquired lands are subject to mineral leasing laws and procedures. Much of the lands adjacent to the project area that were formerly open to mineral entry under the 1872 General Mining Laws have been withdrawn from entry for the purposes of preserving future gemstone rockhounding and recreational opportunities.

Mineral Disposal Authority: Hardrock Mineral Leasing on Acquired Lands

Leasing of hardrock minerals located on acquired lands can be authorized by the Secretary of Interior with the consent of the Secretary of Agriculture. Metals, rare earth elements, and uncommon varieties of sand, stone, gravel, pumice, pumicite, cinders, clay, and gem quality garnets are considered leasable hardrock minerals when located on acquired lands. Laws and regulations pertaining to hardrock leasing activities on acquired lands include, but are not limited to:

1. Weeks Law Lands Act of March 4, 1917

2. Reorganization Plan No. 3 of 1946
3. 43 CFR 3500 Leasing of Solid Minerals Other Than Coal and Oil Shale
4. The Mineral Leasing Act for Acquired Lands of 1947

The Secretary of Interior has been granted the authority to permit prospecting, development, and the utilization of mineral resources for commercial purposes. The Secretary also has the responsibility to assure that stipulations in the permit, lease, or license are followed and adhered to. The Secretary of Agriculture can consent to the issuing a permit, lease, or license, and can identify stipulations protecting surrounding resources should a permit, lease, or license be issued. The Secretary also has the discretion to deny consent to the issuance of a permit, lease, or license if effects of the proposal to the surrounding resources cannot be mitigated or are considered unreasonable.

Collecting of Garnets

Current regulatory rules regarding mineral collecting and saleable minerals disposal on Forest Service system lands can be located at 43 CFR 3505.11 and 36 CFR 228, Subpart C. However, it is helpful to review the past regulatory framework surrounding this area including specific actions related to gem collecting to place the proposed action into a proper prospective.

Collecting of garnets for recreational purposes has been a traditional use of the Emerald Creek area for at least 50 years. Collecting occurred prior to the USFS acquisition of the land in 1970, when portions of the land belonged to Sunshine Mining Company and Potlatch Timber Company. However, when the USFS acquired the lands, staff identified the need to apply some management measures that would constrain the public from digging indiscriminately and causing significant resource damage. This involved posting the administrative closure in 1973 for garnet digging within the area except where a permit had been issued. This closure prohibited “the removal of garnets from federally owned lands except as authorized by a mineral collecting permit or in an area presently under lease”. The pre-existing lease at Shorty’s Gulch, issued in 1966, was the exception to this closure. However, the initial purpose of the lease was to allow the sale of garnet on a concession basis for “rockhound” use. In 1968, the leasee requested that the lease be changed so that he could mine the garnet sand on a commercial basis since “there were not enough garnets to attract rock hounds under the present operation” (BLM records). Business picked up when the USFS closed the area above the lease to random digging.

In 1969, the USFS made a request for an additional concession area to be leased. Advertisements of the new lease were made ready by the BLM but canceled because of public and congressional requests, as numerous comments were made by letter and petition that the USFS be authorized to individually issue permits rather than having another concession in the area.

Special rules were promulgated at 43 CFR 3541 (Federal Record, July 16, 1973), to allow for mineral collection on acquired lands within National Forests and were specific to the Smoky Quartz Area on the White Mountain National Forest, N.H. and the East Fork of Emerald Creek on the St. Joe National Forest in Idaho. The permits needed to be signed by an authorized representative of the Bureau of Land Management. Prior to that time, there was no authority to allow mineral collection except as a mineral lease.

These rules were in specific response to proposed congressional legislation that would designate the East Fork of Emerald Creek as a National Recreation Area. Senator McClure drafted legislation in July 1969 “to establish the Idaho Star Garnet National Recreation Area.” The area was to include all public land within the East Fork of Emerald Creek and its tributaries northeasterly to its junction with the West Fork of Emerald Creek. This bill was to provide the needed authority for the Department of the Interior to issue mineral collection permits. It was based on the opinion of the Regional Forester in Northern Region 1, that without this bill, the area must either be closed to rock hounding or opened to the public through lease to a concessionaire. The bill was never signed. This lack of action was probably due to the fact that another route was taken to achieve the same goal, i.e., changing the Code of Federal Regulations.

In 1973, the USFS opened a garnet collecting area in No Name Gulch. A plan was developed that would allow certain drainages to be systematically mined and reclaimed through a permit system. A memorandum of understanding was prepared with the Bureau of Land Management to facilitate this system; wherein the USFS would administer the mineral collecting permits but transfer the money collected to the Bureau of Land

Management. The plan that was developed is referred to as the Emerald Creek Garnet Management Plan, which is referenced as Appendix AA of the 1987 IPNF Forest Plan.

The Code of Federal Regulations was changed again in 1986 to allow the surface management agency to have jurisdiction to determine which areas and under what conditions mineral specimens may be collected for non-commercial purposes, and to issue permits if required (43 CFR 3560.7). These rules are specific to lands with acquired land status. They had nation-wide application and simplified the process for the USFS. These rules were rewritten again, but with no substantial changes in 1999 and are found at 43 CFR 3503.11 (Federal Register, October 1, 1999, v. 64, no. 190, pp.53511-53556). Currently the Forest Service utilizes a permit system to manage the public recreational use and mineral collecting at the site through the authority granted by the Federal Lands Recreation Enhancement Act (PL10844, December 8, 2005).

Significant past actions that provide direction for the continued extraction of the gem garnet resources in the Emerald Creek Area include:

1) Draft legislation in 1969 by Senator Tom McClure to “Establish the Idaho Star Garnet National Recreation Area.” This area includes all the East Fork of Emerald Creek and its tributaries.
2) Administrative Closure in 1973 for “the removal of garnets except as authorized by a mineral collecting permit or in the area presently under lease from the Bureau of Land Management.” The closure boundary incorporates all the of East Fork Emerald Creek drainage with acquired land status, including Bechtel Mountain. This closure recognizes that garnet collection is occurring in a defined area.
3) Special Rules promulgated in 1973 (43 CFR 3541) to allow mineral collection on acquired lands on the Smoky Quartz Area on the White Mountain National Forest, N.H. and the East Fork of Emerald Creek on the St. Joe National Forest in Idaho.
4) Mineral withdrawal in 1975 of portions of the public domain lands from non-metalliferous location by Public Land Order No. 5523. The justification for the withdrawal was to “protect the streams within the drainage (upper portion of the East Fork of Emerald Creek) in order to facilitate the planned development of the public garnet collection area on adjacent acquired lands.” This action also recognizes that garnet collecting is a popular activity in the area.
5) Rule change in 1986 (43 CFR 3560.7) to allow the surface management agency to have jurisdiction to determine which areas and under what conditions mineral specimens may be collected for non-commercial purposes. While the Emerald Creek area was not specifically mentioned, there are only a few of these areas nationwide and the change made it easier for the USFS to administer these collecting sites.

The series of actions listed above and numerous letters from the public found in the files indicate that recreational collecting of garnets by the public has been considered a prime objective for the Emerald Creek Area. Very few areas have been the subject of unique administrative action, or have, in fact, resulted in nation-wide reform.

Leasing of Garnets

Much of the Emerald Creek drainage that is on USFS lands was "acquired." It is not part of the original Forest Reserve, but was acquired via land exchanges in the 1970s for various purposes, which included garnet collecting and mining. The authority for this acquisition is the Weeks Law of 1911. Lands acquired under this act have Weeks Law status, which means that the mineral rights cannot be obtained by locating a mining claim under the 1872 Mining Law Act. The 1947 Mineral Leasing Act of Acquired Lands made it possible to lease the mineral rights from the federal government. Previous to this time, the only minerals that were leasable were hydrocarbons, such as oil, gas, and coal. With the passage of this act, those minerals on these acquired lands that would be deemed otherwise locatable if they were found on public domain lands, became available for leasing. The Bureau of Land Management retains full authority for hard rock leasable minerals on National Forest Lands. They keep track of the system of prospecting permit applications, lease applications, as well as issue permits and leases. They assess and collect a rental fee and production royalty. They also determine if the prospective lessee has a "discovery" of valuable minerals

before issuing a lease. USFS approval of the mining activity involved with the prospecting permit or lease and it is the responsibility of the BLM to see that the stipulations are adhered to.

Those interested in obtaining mineral rights to an area begin the process by filing for a prospecting permit with the BLM, for which they pay a filing fee. The BLM assigns a serial number to the permit application and forwards it to the USFS for recommendations on surface management protection. The USFS performs a NEPA analysis for a decision on approval and determines the stipulations to attach to the permit. When the BLM receives the USFS decision on the permit, they will issue it and charge an annual fee. This permit gives the permittee preference right to prospect the area and the sole right to apply for a lease to mine the mineral.

The next step is for the permittee to submit a lease application to the BLM and pay another filing fee. At this point, the BLM mineral examiner will determine if there is a “discovery” of valuable minerals and narrow the area of the lease to the appropriate acreage. The lease application is then forwarded to the USFS for a NEPA analysis, decision, and surface management recommendations, similar to the prospecting permit. The Regional Forester can recommend against issuance of a permit or lease if the analysis shows that the proposed mineral activity would seriously interfere with other resource values (FSM 2822.45). The BLM usually rejects permit or lease applications for which the USFS recommends against issuance. An aggrieved party can appeal the decision to a USFS Officer, or to the Secretary of Interior.

Industrial garnet products from the Emerald Creek area are used as packing material in the oil industry, as an inert filter medium in the water treatment industry, as the cutting medium in the water jet cutting industry, and the primary use as an abrasive in sanding, grinding and polishing compounds. Although garnet is one of the most common minerals, very little high-quality industrial-grade garnet is found in economic concentrations. Industrial-grade garnet is produced in Australia, India, North America, China, and South Africa, in decreasing order of production. In the U.S., industrial-grade garnet is produced primarily in New York, Idaho and Montana. U.S. production of garnet is roughly 20 percent of the world market, with north Idaho production representing approximately 50 percent of domestic production, or 10 percent of the world market (Emerald Creek Garnet FEIS, USACE, 2005).

Alluvial garnet is found in small quantities in many of the drainages in this region of northern Idaho. Concentrations sufficient for commercial mining have been found in Emerald and Carpenter Creek basins, and along the St. Maries River below the confluence with Emerald Creek. Garnet concentration and size vary markedly within the drainages. Concentration variation is tied to unique valley bottom conditions at the time of deposition, as well as to variable rates of deposition over time. Coarser garnet is found closer to the source rock. This means that the grade of garnet found in the basins ranges from coarse to fine in the following order: East Fork Emerald Creek, West Fork Emerald Creek, Carpenter Creek, and St. Maries River. Coarser garnet is also found in the upper portions of each watershed. Fine garnet is found in greatest quantity in the St. Maries River floodplain, and in the lower portions of each watershed.

There is a possibility of industrial garnet sands prospecting and development in the East Fork of Emerald Creek adjacent to and on the southern end of the study area. The current method of garnet mining used by operators leaves the larger garnet (greater than 7/16” in diameter) behind in the reclaimed area, essentially preserving the gem garnet resource. The impact of commercial mining on potential gem resources in the East Fork Emerald Creek is difficult to quantify, but it is expected that unless the coarser-grained gem resources are removed at the time of industrial sand mining, that the gem resources would likely be difficult to extract or even unrecoverable in the future due to disruption of the layering within the host sediments.

The USFS recreational collecting site is very popular, attracting thousands of people from all over the U.S. as well as other countries. More information on the recreational garnet collecting site can be found in the Recreation section of this EIS. Enforcement of the prohibition of unauthorized digging in areas outside the designated recreational garnet site continues to be an administrative challenge.

Permits Required

To comply with various mining-related state and federal regulations certain permits are required for the operations to proceed under the proposed alternative. The federal permit is a “Wetlands Permit” from the US Army Corps of Engineers (USACE) commonly known as a 404 Permit.

State permits include a water right from the Idaho Department of Water Resources (granted) for water withdrawals from 281 Gulch and Garnet Gulch for the sluice operation; a Clean Water Act (CWA) Certification under Section 401 of the CWA from the Idaho Department Environmental Quality and a Stream Alteration Permit from the Idaho Department of Water Resources (currently a joint permit process with the USACE 404 program).

Compliance with Forest Plan

For a general discussion and description of the current Forest Plan guidelines see Chapter 1. Implementation of Alternative A, the No Action Alternative, would not meet the original intended purpose of the land acquisition for a significant portion of the lands in the project area nor be consistent with the Emerald Creek Garnet Area Management Plan (Appendix AA of the 1987 Forest Plan) which provides for the development of the garnet resources in the area with particular emphasis given to recreational opportunities. Page III-2 of the Forest Plan states "The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience in accord with its current management direction."

Alternatives B and C are consistent with Forest Plan minerals direction and standards and the Emerald Creek Garnet Area Management Plan direction. Both alternatives provide for collecting opportunities.

None of the alternatives A, B or C include specific decisions regarding future leasing and saleable operations for commercial purposes. Decisions regarding these operations, should they be proposed, would be considered on a case by case basis under the mineral leasing laws, Forest Service leasing and saleable mineral regulations and appropriate agency handbook and manual procedures. The proposals would be analyzed and documented under the National Environmental Policy Act (NEPA), but currently no proposals have been submitted.

Analysis Area

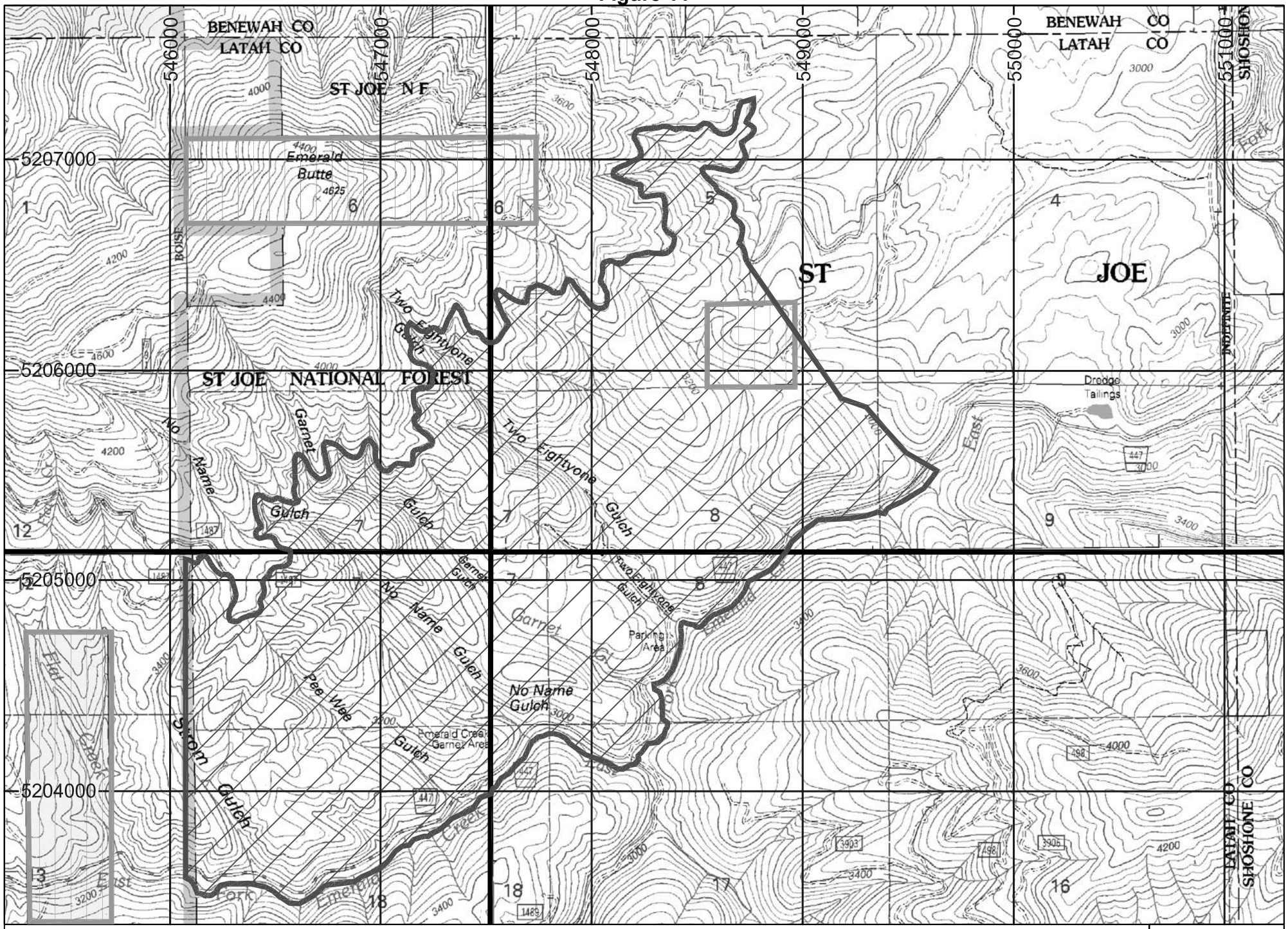
The geographic scope for the Minerals and Geology analysis is defined as an area consisting of approximately 1500 acres including approximately 40 acres of private land. The northern boundary of the analysis area coincides with FS 1487, the southwest boundary with Strom Gulch, the northeastern boundary a line roughly along the eastern drainage divide of "Mystery Gulch" and the southeastern boundary is the East Fork Emerald Creek as shown on Figure 11. This area corresponds to an area larger than the boundaries of the proposed Emerald Creek Garnet Recreation Special Interest Area in the upcoming 2006 Draft IPNF Forest Plan.

The Idaho Panhandle National Forests Forest Plan (1987) designates the analysis area as a combination of Management Areas 1, 4, and 5. Additionally, Appendix AA (Emerald Creek Garnet Area Management Plan) of the 1987 Idaho Panhandle National Forests Forest Plan provides general management information about the garnet collecting area.

Analysis Methods

During the review and alternative development stage of the original Draft Stars and Sands EIS, USFS staff, third-party agency personnel and public reviewers recognized the need for more detailed information regarding the possible location, potential volumes, grades and depths of alluvial garnet placer occurrences in the small drainages located adjacent to the current public garnet site in 281 Gulch and that this additional information would provide a useful geologic framework to help identify potential future public collection sites and rate them on their technical viability and prospects for recreational garnet site development. Office and field investigations were completed in and around the project area starting in the fall of 2002 through the

Figure 11


BENEWAH CO
LATAH CO
ST JOE N F
Emerald Butte
4625
ST JOE NATIONAL FOREST
ST
JOE
Dredge Tailings
Two Eighty one Gulch
No Name Gulch
Garnet Gulch
Pee Wee Gulch
Parking Area
Emerald Creek Garnet Area
Flat Creek
East Fork
Emerald Creek
BOISE
546000
547000
548000
549000
550000
551000
5207000
5206000
5205000
5204000
LATAH CO
SHOSHONE CO
SCALE IN FEET
SCALE IN METERS
Base maps from Abes Knob, Bechtel Butte, Fernwood and Clarkia USGS 7.5' Topographic Quadrangles. Coordinates in UTM Zone 11N, North American Datum 1983.
Quad Boundary
Minerals Analysis Area Boundary
Private Property
National Forest System Lands
TN
MN
IDAHO PANHANDLE NATIONAL FORESTS
St. Joe National Forest
St. Maries Ranger District
Emerald Creek Garnet Area
Garnet EIS: Minerals and Geology Analysis Area Boundary and
Figure 1

summer of 2005 and included:

1. A compilation of historic exploration and extraction sites onto a common base map based on a review of Forest Service files, aerial photographs and interview notes (Appendix H: Map 5);
2. Development of pre-testing site screening criteria and sampling protocols to minimize unnecessary test work in sites deemed unsuitable for future collection sites because of logistical, environmental or geotechnical reasons;
3. Selection of favorable areas for sample collection and testing;
4. Sampling and laboratory analysis of samples from 63 machine-dug test pits in the analysis area Figure 12);
5. Sampling at approximately 160 hand auger sites (Appendix H: Map 5);
6. Development and rating of geotechnical and grade characteristics of potential garnet collection sites in a site evaluation criteria matrix;
7. Preparation and acceptance of recommendations by the Responsible Official for planning of future collecting sites in the lower reach 281 Gulch and central reach Garnet Gulch;
8. Completion of a airborne laser altimetry ("LIDAR") survey to provide large-scale detailed elevation and slope base maps for preliminary engineering design work;
9. Preparation of a general work plan for development of the proposed sites in the main stem of lower 281 Gulch and central reach of Garnet Gulch;
10. Construction and testing of a scaled down flume and settling pond system with pumped recycled water in an upland site in the 281 Gulch drainage to determine settling characteristics, water flow needs and other logistical considerations.

Sample Collection and Analysis Methods

Samples used this analysis were collected from the study area over the course of four seasons from 2002 to 2005 with a tracked excavator equipped with a 1-cubic yard bucket and depth capacity of approximately 19 feet and bucket-type hand augers equipped with a 4.5-inch diameter bucket and a depth capacity of approximately 12 feet.

Sample sites in the analysis area were sited based on their relative topographic position and inferred geologic character in order to obtain information on the depth, thickness, trend and grade of garnet-bearing gravels. The location, depth, width and types of materials encountered during each excavation or auger hole were recorded and used to generate cross sections and plan maps for volumetric calculations. A total of 80 excavator-dug trenches were completed resulting in 214 composite samples which were later processed to recover any garnets larger than 3/8-inch (Appendix H: Map 5). Other ancillary information such as moisture content, presence or absence of organic material, redox character, or other data were collected and recorded where pertinent.

Hand augers were used to provide fill-in points between trench sites. Auger holes were drilled with a 4.5-inch diameter bucket auger to bedrock, until the material was too hard to auger or until the depth was too deep-typically to a maximum depth of 3-4 meters below the ground surface. Because of the character of the gravels, the augers rarely were able to penetrate the gravels entirely, but none-the-less were useful to provide information on shallow subsurface conditions, material grain size distribution and other information such as moisture and organic content. Approximately 160 hand auger samples were collected in 2004 and 2005 (Appendix H: Map 5).

For safety reasons, samples were typically collected directly from the excavator bucket after clearing off sloughed materials to reduce contamination or samples were taken directly off of the spoil piles. Sampling in trenches was initiated where observations indicated the presence of gravels. In nearly all cases gravels were restricted to the intervals closest to underlying bedrock and in these cases sampling usually incorporated the top 0.5 to 1 foot of weathered bedrock. Samples were collected from top to bottom through gravel-bearing intervals, in 0.25- to 0.5-foot intervals. This was done by having the excavator operator carefully push the bucket into the bottom of the trench at its upper end approximately 0.25 to 0.5-feet in

depth and then having the operator pull the bucket back and scrape horizontally across the bottom of the open excavation while simultaneously rotating the bucket and excavator thumb closed. This approach helped reduce contamination from sidewall collapse or sloughing from higher intervals and facilitated more accurate sample volumetric determinations. Depth and volume of penetration were estimated with a tape measure and by direct observations by the geologist on site. Each sample was then taken by inserting a standard shovel into the collected material and recovering material in the shape of a vertical cylinder through the material in the bucket or spoils pile and then placing the material into olefin or canvas bags which were then tied, labeled and transported to the soil lab for analysis.

To assist in planning for stockpiles estimates were made of the materials swell properties - the increase in volume when in-place material is excavated using procedures outlined in McCulloch et al., 2003). Typically swell is reported as percentage change:

$$\text{Percentage swell} = \frac{\text{Volume Loose} - \text{Measured Volume Hole}}{\text{Measured Volume Hole}} \times 100$$

Testing indicates that the average percentage swell factor for garnet-bearing sandy gravels in the 281 Gulch and Garnet Gulch area ranges from as low as 10% in the more sandy materials to as high as 68% in the cobble-rich intervals, but the average for most samples is roughly 25-30%, well within the normal range for these kinds of materials.

To reduce sample bias, the same sampling protocols were utilized throughout the study. Samples ranged from 0.07 to 0.32 loose cubic yard (lcy) per sample interval with most averaging around 0.14 lcy. Larger samples would have provided a more accurate representation of the grade of the gravels but as typical in placer testing the sample size was a balance between accuracy and the need to minimize the potential for unacceptable ground disturbance during the testing phases of the exploration work. Collection, sampling and handling of larger samples would have involved increased equipment and labor costs, greater handling and processing times, and more impacts for sample collection and transport.

In the laboratory, samples were air or oven dried to a consistent weight then individually weighed to the nearest 0.1 kilogram or in some cases to the nearest pound. The samples were then placed into a 15 gallon capacity grout mixer partially filled with water and then rotated to disaggregate and wash the gravels. To assist in cleaning iron oxides and soil from the garnets a small amount of dishwashing detergent was sometimes added to the mixer. The disaggregated sample was then slowly fed into a 24-inch x 24 inch 3/8” nominal diameter steel sieve and pressure washed until all the material less than 3/8-inch in diameter passed through the screen. The 2005 samples from 281 Gulch were washed in the field using running water, 3/8” nominal diameter screens and a flume, but otherwise the sampling protocols were the same. Garnets remaining with the coarse fraction on the screen were then visually located and manually removed and placed into labeled sample bags and dried and weighed with a standard lever balance to nearest 0.001grams. All garnets remaining on the screens were collected regardless of shape, size or quality to insure uniformity for sample to sample comparisons. Duplicate field samples were collected to make rough estimates of sample variability. Garnets recovered from individual trench interval samples were counted, sorted and systematically graded under a high powered microscope by a qualified geologist as described elsewhere in this section.

Often the lower grade garnets from upland samples cannot even be washed and separated because they are cemented together or they fracture and fall apart. In order to break down and dissagregate the samples from the upland areas it was necessary to use a large steel rotary mixer with a strong detergent product to effectively recover the garnets. Longer agitation times were required to break down gravels from the upland areas compared to those from the floodplains.

Drainage Rating Matrix

The technical criteria used to rate prospective future garnet removal sites included: garnet placer gravel tenor or grade; quality of recovered garnets; location and access logistics; overburden thickness and character; surface and subsurface water conditions; overall volume of available gem-bearing material; widths of floodplains; potential public safety and permitting issues; types of removal methods and other engineering factors such as side slopes and soil types. In addition to testing within the floodplain areas, testing of terrace deposits was also completed with hand augers and excavator dug test pits to determine whether there were

viable alternatives to operations in the floodplains. This evaluation was completed in direct response to specific comments received during public review of the earlier Draft Stars and Sands EIS requesting that an alternative be developed restricting operations to non-wetland sites or if not viable to restrict operations to non-fish-bearing drainages. The results of this analysis are summarized in Figures 12 and 13 and discussed in more detail below.

Garnet Placer Gravel Tenor and Grade

Because the quality and quantity of gem quality garnet potentially recoverable at a potential new site is of prime importance to the public visitors who recreate in the Emerald Creek Garnet area, this factor was given the most weight in evaluating potential future sites. The quest for large quantities of high quality gems has been the driving force behind historical unauthorized and illegal "guerilla" digging activities and in selection and operation of organized public garnet collection sites such as the existing site located in 281 Gulch. Support for this assumption can be found in the numerous comments from individuals, rock hounding clubs, school groups and other organizations whose comments are found in the public comments received during scoping for this EIS.

Unfortunately, much of the older historic exploration work conducted prior to the Forest Service acquisition of these lands in the 1960s (Stenz, 1965) is of little practical use because the samples used in these studies were collected outside of the analysis area, were collected in areas now dug out by subsequent operations or were collected without recording details on sample size and volumes. Forest Service sponsored exploration work in the early 1970s is relatively well documented, but was not completed using quantitative placer examination techniques. Nor were samples collected during these older sampling events available for inspection.

In order to best utilize this data it was necessary to find a method to compare the historic data, primarily small volume samples (2-10 pounds per sample) collected with hand augers or from shallow, hand-dug test pits to the data collected in this study, primarily larger volume bulk samples (200-1000 pounds per sample) collected from excavator-dug pits. This was made more difficult and was compounded by past practices that relied on non-conventional or non-quantitative methods for grading (quality and quantity) of the resulting samples. None-the-less, much of the historic data was useful in establishing, at least in a general way, the likely presence or lack thereof of large diameter, gem-quality garnets in a given location and was used to focus efforts during locating sample test sites for this study.

Conventional metallic placer deposits (gold, platinum, titanium sands) are often rated by the dollar value of the commodity per cubic yard (for instance the grade of gold placers is often reported in cents per bank cubic yard of gravel). Gem placer deposits are rated by comparing the grades of deposits in carats per bank cubic yard. A carat is a weight measure utilized for diamonds and other precious gemstones and is equivalent to approximately 1/5 of a gram or 200 milligrams. Because the older historic data sets reported weight of the original sample along with the weight of garnet recovered, but generally not the volume that was excavated to obtain the sample material a semi-quantitative valuation methodology was developed and applied to the historic data and recently acquired sample data for comparison purposes. This was done by converting sample analytical results to a common ratio representing the weight of the recovered garnet (> 3/8" diameter) reported in grams, per weight of original raw gravel sample (reported in dry kilograms) from which the garnets where recovered.

The grams of garnet to kilograms of dry gravel (g/kg) ratio was utilized to facilitate incorporation of the older data sets and allowed for comparison of samples from differing weights (or volume equivalents). A higher ratio for one sample versus another equates to a higher relative garnet content in the sample with the higher ratio value. The weight ratio calculated as described above was then converted to a more conventional grade-rating scheme (e.g., carats per bank cubic yard or in this case pounds garnet per cubic yard gravel) using estimates of the density of the material sampled. Since determination of the density of the older samples was impossible it was estimated from material properties tables common in civil and mining engineering texts. The in-place density (commonly known as bank density) of dry sand and gravel typically ranges from 81-126 pounds per cubic foot (SME Handbook, Table 2.1, pp 13) and in this study a bank density of 102 pounds per dry cubic foot of material was applied since it is midway in the range and a

reasonable value based on the authors experience. Figure 12b report the grades of samples collected during this study in pounds of garnet recovered per cubic yard gravel (lbs/bcy) sampled.

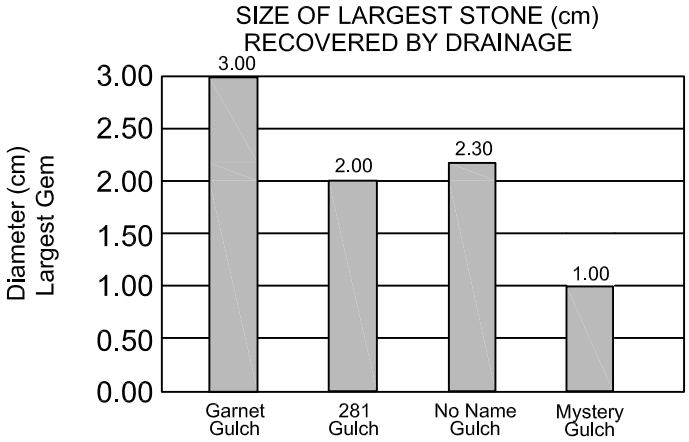
However, the weight to weight ratio or the weight to volume ratio only describes the relative weight distribution and does not address the "quality" considerations that are equally important. Although previous grading rating schemes with roman numerals or text qualifiers such as "good" or "fair" were utilized in previous investigations, these are not standard gem-grading criteria. Samples in this study were graded utilizing criteria modified from, but generally consistent with standard industry gem-grading methodologies such as those promulgated by the American Gemological Laboratories (AGL). Stones were graded based on their size (big = better), transparency or "tone" (clear better than opaque), inclusion content or "clarity" (excessive inclusions = bad), color (red or purple good versus black) and presence or absence of fracturing (no fracturing = better). Unlike traditional gem grading criteria, which rates inclusion-free stones higher than inclusion-rich stones, this rating scheme actually rates stones higher if there are some inclusions, provided they are not too excessive and cause the stone to be completely opaque. This is because the "star" asterism is caused by the presence of certain kinds of inclusions oriented within the crystal lattice. This unique property, while not uncommon in some other precious (corundum) and semiprecious gemstones varieties ("tiger's eye" quartz) is extremely uncommon in garnets. This uniqueness is what has kept the demand for Emerald Creek area garnets strong from recreational hobbyists and commercial gem dealers for over 60 years (Dake, 1946; Lame, 1953; Stewart, 1967; McMackin, 1977; Luvass, 1979; Ream, 2000). The presence or percentage of sand-size garnet material utilized in commercial industrial applications was not analyzed in this study. The definitions of the quality "grades" used in this study are given below:

> *Waste-grade*: Samples too weathered, small, oddly shaped, fractured, inclusion-rich or that exhibit other properties that keep them from meeting any of the grading criteria given below;
>
> *Specimen-grade*: The sample typically does not have polishing or faceting potential, but is exceptionally large, contains well-formed ("euhedral") crystal faces, or has unique crystal form or habit (trapezohedrons versus dodecahedrons, twinning, attached bedrock, etc.) that make it desirable by collectors.
>
> *Tumble-grade* (also known in the gem trade as "tumble rough"): The sample typically is fractured, too small, inclusion-rich or has other defective characteristics that make it unsuitable for cutting of cabochons or as for use as facet-grade material. However, the sample can be tumbled to produce highly polished, rounded fragments that are utilized in semiprecious gem pendants, pins, necklaces, rings, etc. Specimens that have sucrosic textures (e.g., "sugary") or material that is too weathered or inclusion-rich that it likely to disaggregate in the tumbling process and is not suitable as specimen-grade material is not rated as tumble-grade and is treated as waste.
>
> *Cutting-grade*: The sample is typically large enough to cut into cabochons and is sufficiently free of fractures or excessive numbers of inclusions to withstand cutting, grinding and polishing. This type of material is actually some of the most sought after material in the Emerald Creek areas as the almandine garnets from the area often contain minute needle-like rutile (titanium dioxide) inclusions which produce a pronounced "star" asterism or silky appearing line of light ("ray") on a polished surface when illuminated with a bright light source if the stone is cut in the appropriate orientation (Walcott, 1939; Agee, 1965; Zimmerman, 1986; Feather, 1996; Gunther et al, 2005).

Facet-grade: The sample is sufficiently well formed, unweathered, crystalline in character, and essentially fracture and inclusion free to the degree that a faceted stone can be cut from the material. Although they can be faceted, facet-grade garnets from Emerald Creek are often cut into cabochons to allow the stone to exhibit the "star" asterism in the most pleasing fashion.

Although, there has been considerable informal discussion and debate over the relative "grades" of specimens collected from the various tributary drainages in the East Fork Emerald Creek over the past 20-plus years of investigations by Forest Service staff and rockhound collectors (Dudley, 1966), there is little truly quantitative evaluation of the occurrence and variability of "star" garnets. This is in part due to some of

Figure 12
Comparison Project Area Drainages
Garnet-Gravel Deposit Characterisitics



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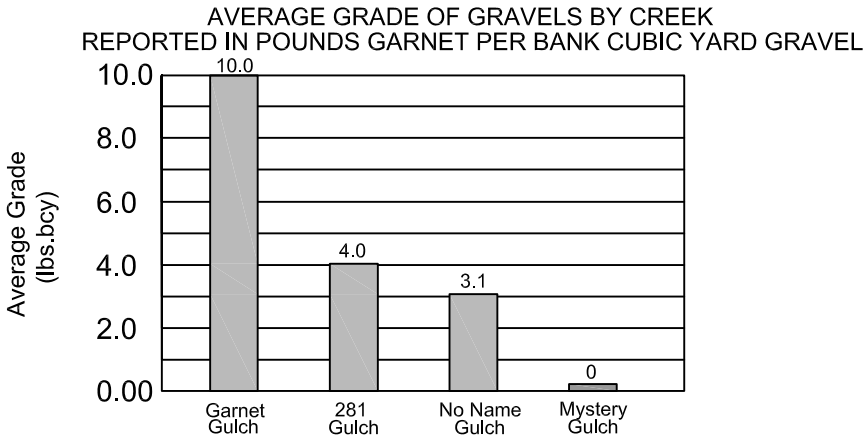

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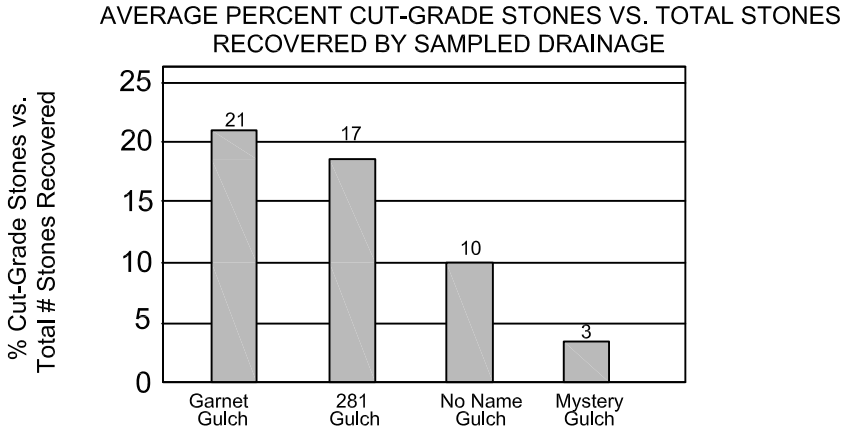

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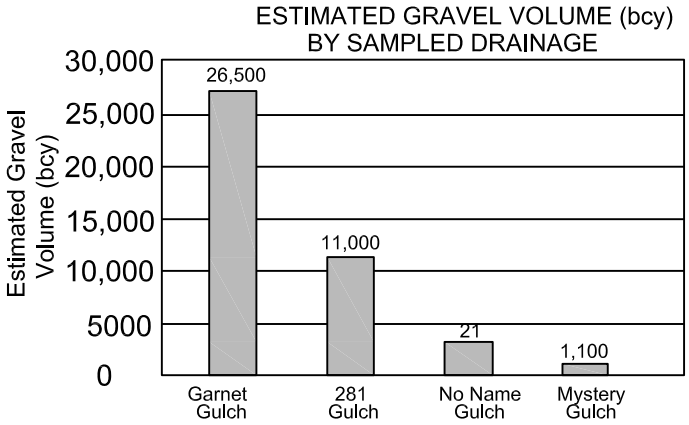

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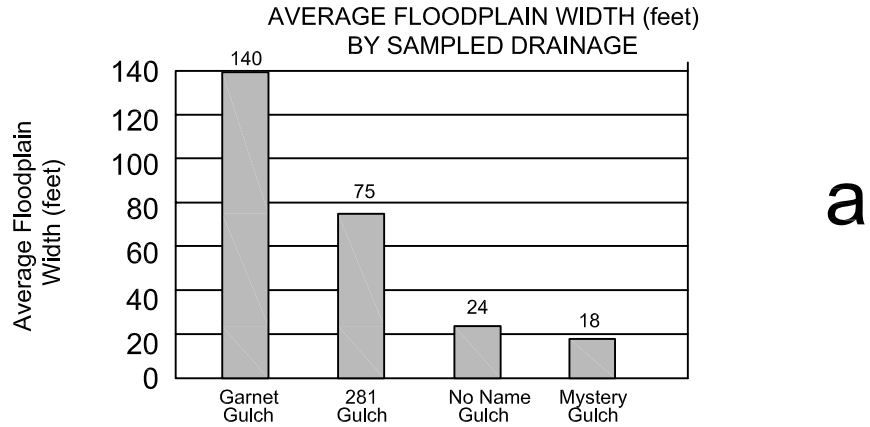
Figure 13
Comparison Project Area Drainage Geotechnical Considerations



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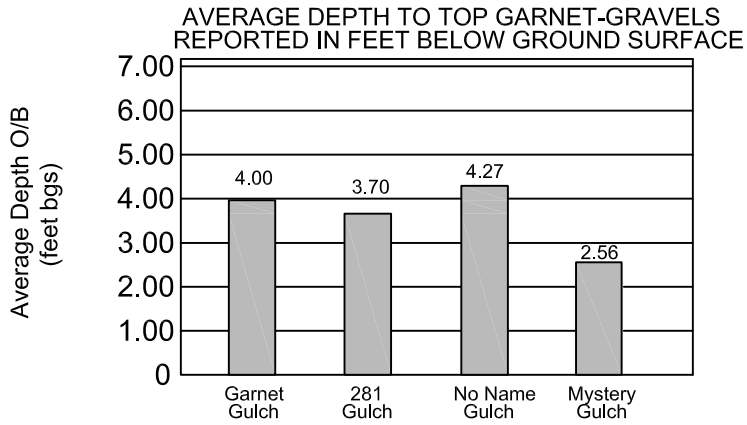

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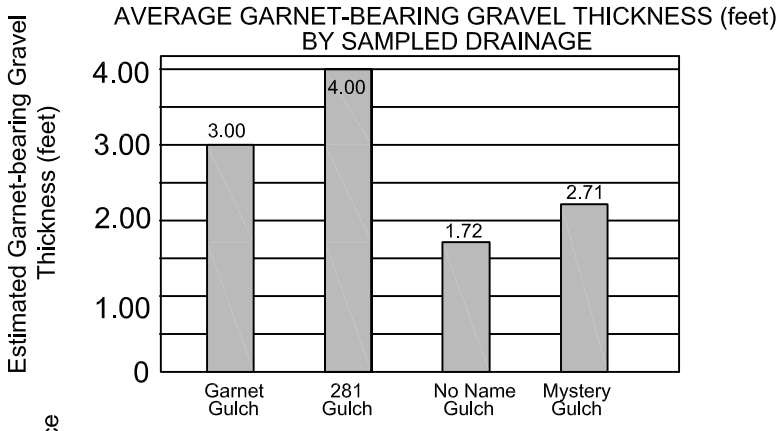

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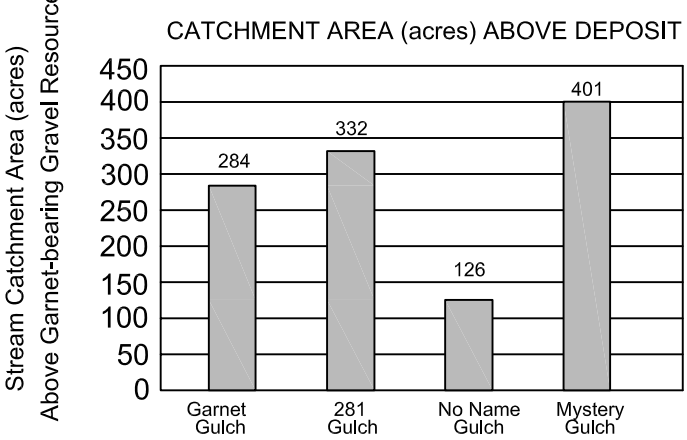


d

the considerations described in the section above and also due to the statistical variability associated with grain-size distributions and sampling issues related to large dense particles in placer deposits. Based on examination of over 7600 garnets recovered from samples collected during this study, it is likely that all the drainages contain relatively consistent proportions of garnets that have the potential for producing stones exhibiting the desired "star" asterism. One possible reason for the debate is the natural differences in relative preservation potential (from physical erosion, and preservation factors) of stones of sufficient size, crystallinity, and shape to be cut into cabochons within the sampled drainages. Better placers tend to have more star garnets because there are more garnets there in the first place.

In this evaluation, the highest rating was assigned to facet-grade material, as it can be cut into cabochons if so desired and is still highly prized by collectors and dealers, followed by sequentially lower values for cutting-grade, specimen-grade, tumble-grade and waste-grade. Sample sites or streams with no gem garnets were given no value.

The largest average gem stone recovered from all the drainages during sampling (2002-2005) came from Garnet Gulch followed by No Name and 281 Gulch (Figure 12a). The highest average grade (reported in pounds garnet per bank cubic yard of gravel) came from Garnet Gulch, followed by 281 Gulch and Non Name Gulch (Figure 12b). The highest percentage of gems (reported as percent gems from total number garnets recovered per sample) came form Garnet Gulch, followed by 281 Gulch and Non Name Gulch (Figure 12c).

Floodplain Width

Floodplain width was deemed to be an important factor to consider in rating the various potential sites and drainages due to the issues related to access, water management, equipment maneuverability, room for public facilities and potential for increased volumes of gem-bearing gravels. More importantly, the floodplain width was considered a critical evaluation factor due to side slope stability issues. Narrow, steep-sided gulches present a multitude of geotechnical, slope stability, hydrologic, water management and public safety issues as compared to wider, shallow gradient floodplains. Essentially, this factor rates large wide floodplains with shallow gradient banks higher than narrow, steep-sided gulches. Figure 13a outlines the differences between the floodplain widths across the areas of known garnet-bearing gravel resource of the various drainages analyzed during this study.

The widest floodplains with potentially recoverable gem garnet resources are located in Garnet Gulch, followed by 281 Gulch and No Name Gulch (Figure 13a).

Location and Ease of Access

Outside of the existing road into the lower end of 281 Gulch there are currently no open, accessible developed roads to any of the potentially recoverable garnet-bearing gravel deposits. High precision topographic and slope maps produced from the LIDAR laser altimetry survey data were used to rate potential access routes to drainage sites within the study area. Sites with shortest possible routes from existing roads and shallowest slopes and fewest stream or gully crossings were rated highest.

Since 281 Gulch has existing access it was rated the highest, followed by Mystery Gulch, Garnet Gulch and No Name Gulch.

Overburden Thickness

This factor was developed to assess the issues involved with removal of the amount of subsoil material (e.g., overburden) that overlies the garnet-bearing gravels. Areas with thinner overburden were rated higher than areas with thicker overburden. Issues associated with thicker overburden intervals include:

1. Increased equipment and labor costs associated with the need to excavate deeper and move more material to reach the garnet-bearing gravel layers;
2. Increased size of equipment needed for deeper excavations;
3. Likelihood of increased soil compaction due to use of larger equipment;
4. Increased safety and erosion risks due to bank slumps or high wall failures;

5. Increased possibility of the spread of noxious weeds due to the need for larger stockpiles;
6. Increased area of disturbance (e.g., site footprint) due to larger stockpiles;
7. Need for larger sidewall laybacks (shallower pit wall angles) to accommodate OSHA and MSHA safety requirements for open deep excavations;
8. Increased time of open cut exposure (and subsequent erosion risks) to remove larger volumes of overburden.

The least amount of overburden was located in the small resource area in Mystery Gulch, followed by 281 Gulch and Garnet Gulch. Figure 13b compares the relative amounts of overburden that would have to be removed to reach the top of the garnet-bearing gravel deposits in each of the drainages present in the study area.

Evaluation of Water Management Issues

This evaluation factor was developed to deal with the issues related to water management in a potential garnet removal site. Elements used in rating this factor include:

1. The need for a source of useable water for washing of the garnet-bearing gravels;
2. The ability and technical feasibility of diverting water from the active excavation site for safety, slope stability and sediment retention reasons;
3. The ability of the site to host an effective sediment catch basin/settling pond system to eliminate sediment discharge issues.

Potential Volume of Available Material

This factor was developed to deal with the issues related to time, capital cost and logistics of infrastructure development for smaller occurrences and deposits of gem-quality material identified in testing. From the development standpoint, the effort to explore for, permit and develop a new site is best justified for larger deposits that will provide for the goals outlined in the purpose and need for the longest time frame. Figure 13d outlines estimates of available garnet-bearing gravel resource in the evaluated drainages.

Factor Summary

Based on a comparison of these evaluation criteria, the conclusion by the Responsible Official after consultation with staff resource specialists was that the most favorable drainage for development of a future public garnet collection site after completion of operations in 281 Gulch is located in the central reach of Garnet Gulch (PF: PD-26).

Existing Condition

Regional Physiographic and Geologic Setting

The study area is situated at the junction of two major regional physiographic provinces. North and northwest of the study area lies the Columbia River Plateau and to the south and east lay the terranes associated with the Northern Rocky Mountain province. The study area is located near and along the demarcation line between these two provinces which consists of a broad, structurally complex, deep-seated, multiphase fault and fold system commonly known as the Lewis and Clark Line (Griggs, 1973; Bennett, 1986). The oldest rocks in the area are highly metamorphosed sedimentary rocks, probably correlative with the Early to Middle Proterozoic-age Belt Supergroup. Older metamorphic rocks of unknown affinities are exposed to the east in the Boehl's Butte area and east of St. Maries. Dikes and sills of gabbroic and granitic composition, likely plutonic outliers of the Mid-Jurassic- to Mid-Cretaceous-age Atlanta Lobe of the Idaho Batholith, are dispersed throughout the vicinity and major stocks and elongated bodies of plutonic rock are exposed just to the south of the study area. Early Tertiary-age felsic volcanic and high level plutonic rocks are found east of St. Maries and west of the study area near Bovill (Lewis, et. al., 2005).

Early workers utilizing isotopic dating methods suggested the Belt Supergroup rocks to the north in the Coeur d'Alene area were metamorphosed to greenschist facies during Middle Proterozoic time and that the

rocks to the south north of the Idaho Batholith were metamorphosed during the Mesozoic (Hobbs, et. al, 1965). Later workers (Reid and Greenwood, 1968) described a much more complex history for rocks exposed in the upper St. Joe Region suggesting these rocks may have been subjected to several metamorphic events starting in the Proterozoic at about 1.2 billion years before present, with a another event around 670 million years before present (m.y.), a third at around 300 m.y., and two smaller events at around 172 m.y. and 41 m.y. The later two events, likely related to the large-scale regional metamorphic effects of intrusions associated with the Idaho Batholith complex and are probably responsible for the typical metamorphic assemblages found in the area's rocks today.

During the late Cretaceous through the Tertiary the combination of existing topographic and geologic grain, tectonic forces and syn-eruptive extensional basin development led to the formation of three major embayments in north Idaho in the Weiser, Clearwater and St. Maries areas. During the later part of this period, during the Miocene the volcanic rocks of the Columbia River Basalt Group were deposited within the embayments along with associated fluvial and lacustrine sedimentary sequences. The St. Maries embayment is located within the watersheds of the modern-day St. Joe and St. Maries rivers along the northeastern edge of the Columbia River Plateau. Figure 14 is a generalized geologic map compilation from Lewis et. al., (2005) that shows the regional geologic setting. The unit labeled '*Ysw*' on the map is comprised of predominantly fine-grained aluminous schists which are interpreted to be the metamorphic equivalents of the Lower Member of the Wallace Formation that are considered by most workers to be the garnet-placer source rocks.

Local fissure-type basaltic volcanic eruptions flowed into existing valleys as well as onto the plateau and in several places dammed the existing streams forcing the streams to form lakes, reroute or incise back through the basalts in an effort to reestablish their equilibrium. The unit labeled '*Tcr*' on Figure 14 are areas mapped as part of the Columbia River Basalt Group. In some places, as in the St. Maries River valley, the valley-filling basalt dams were formed and breeched numerous times during the Miocene resulting in the widespread development of lakes and backwater swamps. The landforms and sediments from these dam-building and dam-failure events are now preserved as thick accumulations of unconsolidated to weakly consolidated, fine-grained sediments in the broad valley-floors or as thin terrace remnants on valley walls and lower elevation flattened hilltops (unit labeled '*Ts*' on Figure 14). These basalt units often overlie and in some cases are interbedded with fine-grained, thinly laminated to thinly bedded, occasionally fossiliferous, lacustrine sediments of variable thickness interpreted to be correlative with the Latah Formation found in the Plateau regions. Most of the area is overlain by a thin veneer of homogeneous, very fine-grained wind blown silts, commonly called loess interpreted to be correlative with the Palouse Formation a widespread unit to the west in the Palouse region of eastern Washington and northwestern Idaho.

At a more local scale, the study area is dominated by two primary physiographic features, the Hoodoo Mountains to the southwest and the St. Maries River Valley to the northeast. The Hoodoo Mountain Range trends northwest-southeast, with elevations averaging around 4,000-4,500 feet, with a peak height of around 5,500 feet. The range acts as the local drainage divide between the Palouse River and St. Maries River drainage systems. Streams draining the northeast side of the Hoodoo Mountains empty in to the St. Maries River system and those to the west into the Palouse. The range is high relief, rugged, but well dissected and air photos show numerous areas of active stream capture reflecting a relatively mature, but actively changing landscape. The linear, northwest-southwest trending St. Maries River valley is parallel to tectonic and geologic features in the Hoodoo Mountains to the west and larger scale structural elements to the Northwest in the Coeur d'Alene area (Griggs, 1973; Bennett, 1986).

Paleogeographic reconstructions suggest the dominant flow direction of the ancestral St. Maries River during the Miocene was from southeast to northwest parallel to the river's modern flow direction (Smiley, 1989). Strong linear northwest-southeast oriented topographic trends and air photo linears present along the current trace of the St. Maries River valley between Fernwood and Clarkia parallel a number of bedrock structural elements (e.g, faults) that likely were present prior to the Miocene (Smiley, 1989). There is debate among workers in the area as to whether these structural elements were active in the area during deposition of the units hosting the garnet-bearing gravels, but field work completed for this EIS suggests that at least locally some of these structural zones may have been syn-depositional basin bounding faults and may have provided a mechanism for abrupt stream gradient changes leading to development of the garnet placers.

For instance a number of extremely linear slope breaks are present within the greater limits of the study area separating areas with primarily residual bedrock soils and no sediments from areas underlain by unknown thicknesses of fluvial or lacustrine (lake) sediments as represented in the soil auger samples (PF: M-1, pp. 1-185 and slope map (PF: M-4, p.33). The fluvial-lacustrine sediments likely represent an ancestral river terrace feature which cuts through the study area. Based on soil auguring and excavator trenching it is apparent that some of these linears mark extremely abrupt changes in subsurface bedrock relief not necessarily correlative with modern topography. For instance, observations made in the public dig site in the West Fork of 281 Gulch in 2002 indicated bedrock was present roughly 6-8 feet below the ground surface. A vertical dike, parallel to the dominant linear direction in the immediate area cut the schist at this location. No ancestral terrace sediments were present above the dike and garnet-bearing gravels consisted of a single lens directly on bedrock. Less than 100 feet laterally downstream from the dike, the top of the bedrock surface drops to over 30 feet below the present ground surface, yet the surface topography between the two points has an elevation difference of about 5 feet. Below this point at least three separate gravel lenses are present in the thicker sediment section.

Study Area Geology

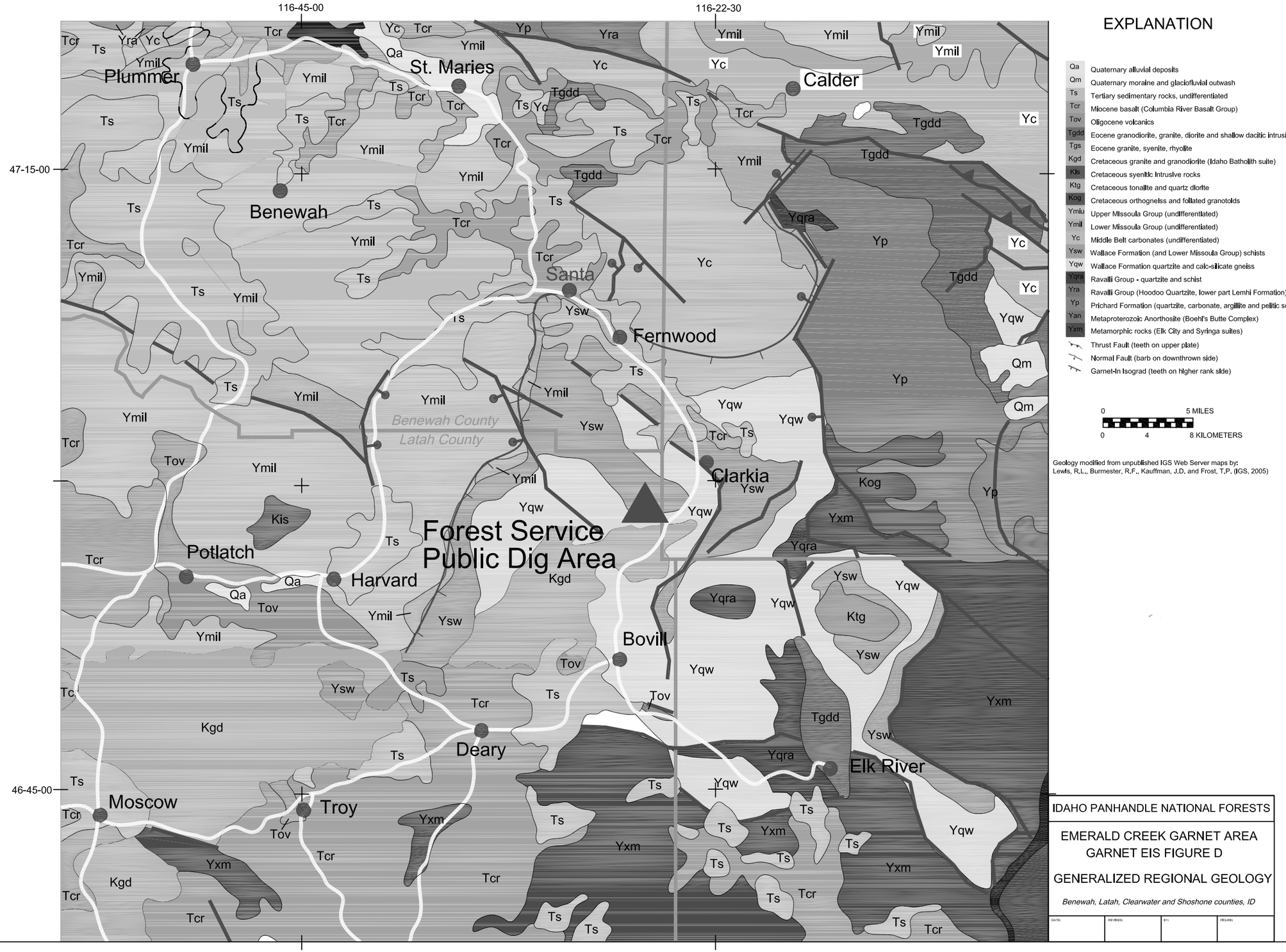
Mapping by Clark (1963), Hitzman (1975) and field observations made during this study indicates the bedrock in the analysis area consists of medium to high rank, well foliated metamorphic rocks, mostly siliceous, micaceous schists, muscovite-rich phyllites and granoblastic textured micaeous quartzites. Intercalated equigranular, poorly foliated calc-silicate granofels and banded gneisses, fine-grained foliation parallel bodies of amphibolite and minor weakly sulfidic graphitic siltites are present locally, but uncommon. These metamorphic rocks were likely derived from Precambrian sedimentary rocks. Schists exposed along the road cuts adjacent to the East Fork of Emerald Creek are typical of those throughout the study area and are composed of muscovite + biotite + quartz + plagioclase $\pm$ garnet $\pm$ staurolite $\pm$ kyanite $\pm$ sillimanite. Locally zones of migmatic biotite + kyanite + staurolite + garnet rich rock are present as lozenges within foliation planes often associated with bedding parallel kyanite crystals.

Granodiorite, quartz monzonite and associated lessor amounts of more felsic and mafic intrusive rocks occur immediately south of the study area with a few scattered dikes and sills outliers within the study area. The igneous rocks are generally considered to be part of the northwestern part of the Atlanta Lobe of the Idaho Batholith, and range in age from Late Jurassic to Mid-Cretaceous, although some may be as young as the Tertiary. Within the intrusive complexes, abundant rotated xenoliths, irregular contacts and localized metasomatic alteration zones suggest the intrusions assimilated country rocks during crystallization (Hietanen, 1961, McNeil, 1971). Observations made during field work associated with this EIS suggest igneous bodies may also underlie parts of the study area at depth based on the local presence of migmatitic zones, common occurrences of small foliation parallel and cross cutting pegmatite bodies, extensive quartz veining and presence of dikes and sills.

Just east and northeast of the study area, near Clarkia and the Emerald Creek mill respectively, outcrops of vent-facies basalt flows, probably correlative with the Miocene Wanapum Formation of the Columbia River Basalt Group are exposed along road cuts and along the walls of the valley bottoms (Clark, 1963; Smiley and Rember, 1979). The basalts exhibit textures ranging from dense, massive, blocky flows to bulbous, highly vesicular pillow complexes, or to massive columnar lava. Locally near vents, flow contacts or in areas of flow collapse or slumping volcanic breccias are present. Excellent exposures of well formed columnar basalts are exposed along the south side of the road along the East Fork of Emerald Creek just south of its junction with the St. Maries River. Pillow basalts are also well exposed approximately 1 mile northwest of the Forest Service Clarkia Work Center along the St. Maries River and in road and railroad cuts (Clark, 1963) and exhibit exceptionally well preserved tubular pillows suggestive of deeper, open water depositional environment (Smiley and Rember, 1979). Smiley and Rember (1979) identified three likely Miocene basalt dam sites in the immediate area. One site, located near Santa, another located approximately 4 miles south of Santa and a third site just north of Clarkia. These dam sites likely at least temporarily dammed up the ancestral St. Maries River and also its tributaries (including the East Fork of Emerald Creek) causing lakes and slack water conditions to form in the former river beds behind the dams.

Figure 14

EMERALD CREEK GARNET AREA REGIONAL GEOLOGY



IDAHO PANHANDLE NATIONAL FORESTS

EMERALD CREEK GARNET AREA
GARNET EIS FIGURE D

GENERALIZED REGIONAL GEOLOGY

Benewah, Latah, Clearwater and Shoshone counties, ID

DATE:	REVISED:	BY:	FIGURE:

A significant geological control on the deposition of garnets in the local study area appears to be a sequence of mostly fine-grained sands and silts (which often contain fossils of leaves and fish) deposited during the Miocene informally known as the Lake Clarkia sequence (Smiley and Rember, 1973) deposited behind these basalt flow dams. Remnants of the lake beds, now broad and flat valley floors, and flat to shallow-sloped upland terraces caused the deposition of the gravels containing dense garnets as the steep gradient mountain streams intersected the broad, deep waters of the lake section, slowing the water velocity and causing the denser garnets to preferentially drop to the bottom of the water column adjacent to the zones of abrupt gradient changes. Locally, the lacustrine deposits exhibit hydrothermal alteration assemblages (zeolites) possibly related to former hot springs or heated groundwaters warmed by contact with subsurface magmas associated with the contemporaneous basaltic volcanism.

Garnet Source Rocks

A sequence of garnetiferous micaceous schists, probably correlative with the Upper Argillite Member of the Precambrian Wallace Formation (Unit '*Ysw*' on Figure 14) is the likely source rock for both gem and sand-size garnets found in the placer deposits in the study area and adjacent drainages. Large garnets (greater than one pound in weight) to sand-sized garnets are found in bedrock exposures of this schist sequence in a broad north-northwest trending belt and as placer deposits in drainages dissecting the belt. The garnets are the result of the metamorphism of the original sedimentary rock units during mountain building events. During metamorphism the iron-, aluminum- and magnesium-rich sediments were converted to garnets under conditions of high heat and pressure.

Garnets are classified by mineralogists based on variations of their chemical composition, primarily their iron, calcium, manganese and magnesium contents. Emerald Creek garnets are typically pink to purple or more commonly nearly opaque dark red almandine variety ($Fe_3Al_2Si_3O_{12}$). Compositional variations are present within the garnets found in the area, but typically they consist of around 35-38% SiO_2, 33-37% Fe_2O_3, 20-27% Al_2O_3, 3-5% MgO, 0-2% CaO, and 0-1% MnO (Hoffer and Cavin, 1964; Hofmesiter et al., 1996; Jim Evans, personal communication 2005). Garnets from the area have specific gravities typically in the range of 4.0 to 4.1 and hardness on the Moh's Scale between 7.5 and 8.0 (Jim Evans, USGS, personal communication 2005).

Some workers have suggested that larger garnets tend to be found along the hinge line of a northwest plunging synform (the trough of a fold in the rock layers that is tipped on end) in a schist unit probably correlative with the upper argillite member of the Wallace Formation. The hinge of this synform trends northwest to southeast through the central part of the analysis area base on unpublished maps by Clark (1963) and Hitzman (1975). Bechtel Butte is located on the eroded nose of this syncline. Rember (1996) and Nicholson et al., (2005) have reported that the size of the individual garnets in bedrock is dependent on the depth of the schist and the proximity to the axis of the syncline. The largest garnets are reportedly found nearer to the base of the synform and closer to the axis of the syncline. Interestingly, the largest garnets recovered from placers in this study are proportionately larger in streams draining the hinge area of the synform. Elsewhere in the region, exceptionally large garnets are typically associated with dikes and sills of amphibolite (Hietanen, 1961). Float and weathered subcrop exposures of intensely altered amphibolite containing large garnets in the analysis area indicate this may be the case here as well.

The large garnets (greater than $^3/_8$" in diameter) are sought both as gems and collector specimens. The study area produces an extraordinary quality and quantity of large garnets. The gem quality is exceptional, in part because the garnets maintain their dodecahedron crystal shape and are not prone to fracturing. Drainages in the study area are all known to produce star garnets. These internal "stars" are an asterism caused by internal light reflections and refraction off of crystal inclusions, such as rutile or ilmenite, within the garnet crystal structure (Walcott,1939; LJ, 1965; Feather, 1996; Zimmerman, 1986; Gunther et al., 2005). Thin section examinations of garnets from the study area indicate garnets contain numerous solid inclusions of ilmenite, apatite, quartz, zircon and monazite (Jim Evans, USGS, personal communication, 2005). The inclusions form during garnet crystallization when impurities are released from the garnet crystal upon cooling. The star is an optical phenomenon called chatoyancy in which a movable wavy or silky sheen is concentrated in a narrow band of light that changes its position as the mineral is turned. It is best seen in cabochon-cut stones. The only other location in the world that is known to have significant quantities of star

garnets is in India (Spendlove, 1985). Garnets or garnet chips that are at least ¼" in size, not highly fractured, and do not contain too many inclusions (such as mica) can be cut and polished into a cabochon.

Placer Deposit Genesis

Placer deposits are formed by a variety of processes, but all have several things in common. First, there must be a primary source rock from which the mineral that will be ultimately concentrated into a placer deposit is derived. In the Emerald Creek area there are widespread occurrences of garnet-rich source rocks. The enrichment of garnet in bedrock units of the area probably reflects the primary iron- and aluminum-rich character of the sediments that make up the bedrock units and the overprinting of these chemically favorable rock types by the influx of heat and hot reactive metamorphic fluids at the regional scale from the Idaho Batholith, in addition to localized fluid flow along shear zones and local heat sources such as intrusive dikes and sills. A 5-mile wide x 15-mile long, northwest-trending belt of medium- to high-rank mica schists, unit '*Ysw*' on Figure 14, extending from just east of Clarkia to west of Santa are the source rocks for the industrial placer garnet deposits in the broad floodplains of Emerald Creek, Carpenter Creek and the St. Maries River and the gem deposits in the analysis area as well.

Before a placer can form, the placer mineral must be broken free from the rock matrix. In the Emerald Creek area the release mechanisms involve intense weathering under near tropical conditions during the Miocene. The early Miocene climate was marked by short mild winters and rainy, warm summers. These humid conditions locally led to intense physical and chemical weathering of the older rocks exposed in the stream catchment areas providing a mechanism for the liberation of the resistant minerals from their host rock matrix (e.g., garnets from their schist host) due to the intense leaching action of humic acids in the soils. The more chemically-resistant garnets survived the decomposition of the bedrock to later be concentrated by other physical processes.

Once a placer mineral is free from its rock matrix it must then be sorted and concentrated in a fashion that makes it amiable to recovery into "traps". In the Emerald Creek area the sorting and concentration mechanisms involve one or more physical processes related to widespread fluvial systems dissecting the garnet-rich source rock areas. Fluvial systems developed on, and eventually began to incise through, the highly saprolitized (e.g., weathered) soils sorting and concentrating the loose garnets previously released by weathering processes into traps. These traps formed where abrupt changes in stream gradients or other physical features caused sudden decreases in stream velocities reducing the sediment carrying capacity of the host stream systems and causing the denser garnets to preferentially accumulate in deposits.

For a placer deposit to be available for future recovery it must have a preservation mechanism. In the Emerald Creek area the preservation mechanism was the burial of the placer deposits under fine-grained lake or lacustrine sediments during the Miocene or burial under thick sequences of windblown dust or loess or reworked fine-grained water lain deposits.

Garnet placer deposits in or adjacent to the study area can be classified into several categories based on their mode of occurrence and genesis:

1. **Residual** placer deposits are found in several areas adjacent to the study area and are the product of *in situ* weathering and concentration of garnets in the soil profile and regolith above garnet-bearing bedrock units. Weathering and soil forming processes free up the garnet from the rock matrix and are then concentrated by free-thaw action, bioturbation activity and other soil processes. Deposits are known from the Bechtel Butte area and are currently under evaluation by commercial operations working under Prospecting Permits and Mineral Leases. These types of deposits can be widespread, but often have limited volumes, sporadic grades, and typically occur as thin accumulations along the transition zone between topsoil and regolith or weathered rock. Exploration work in the study did not disclose any residual deposits, although they may be present at depth's greater than evaluated during excavator and hand auger testing or in areas not tested to date.
2. **Elluvial** placer deposits are similar to residual deposits and occur when slope movements such as landslides and soil creep concentrate garnets through slope-forming and mass movement processes. Where the mass movement processes push the garnet-bearing soils into creek or rivers they can be reconcentrated into alluvial placers. These types of deposits typically occur as small,

thick to thin, lenticular to ovoid accumulations at the base of slopes or on steep slopes where there are slope irregularities to concentrate garnets during intense rain storms or mass movement events. Examples of these types of deposits are found in the Wood Creek and Bechtel Butte areas. A small elluvial type deposit was located at the junction of the East and West forks of 281Gulch on the northwest banks in Test Pit T281-05-1 and in adjacent soil auger samples. The top of the deposit is greater than 12 feet deep beneath the ground surface and because of the geotechnical characteristics of the site location was determined to be unsuitable for the proposed recreational extraction activities with the currently proposed operations methodology. Additional work will be required to determine the optimum method for recovery of the gem garnet material at this location.

3. **Alluvial Gulch** placers are the most common deposits in the study area and have been the source of most, of the gem garnets recovered historically from within the analysis area. These deposits occur where high gradient mountain streams cut through garnet-bearing bedrock units and erode, sort, and ultimately concentrate the garnets into placers. Typically these placers are deposited as elongated lenses within the active channels with highest concentrations occurring in traps in stream bends, under boulders or logs or other sites where abrupt changes in stream gradients cause a change in water velocity. Examples of these types of deposits in the study area include the previously worked occurrences in No Name, Pee Wee, East and West Forks of upper 281 Gulch, and upper Garnet Gulch.
4. **Alluvial Sheet** placer deposits are found in the broad floodplains of the St. Maries River, the East and West Forks of Emerald Creek and Carpenter Creek where rivers draining the high relief mountain areas suddenly hit the broad floodplains of the main trunk drainage systems. In the Emerald Creek region, during the time of placer garnet deposition these trunk drainages were slow-moving rivers and lakes and the confluence of the mountain streams with the broad, slow-moving valley river systems tended to produce large deposits of sand-size garnets with sheet-like geometries. These sheet-sand deposits, possibly generated as submarine turbidity flows, do not tend to have high percentages of coarser-grained gem size garnets, but are sought after by commercial interests for industrial garnet production and have been producing a large percentage of the world's abrasive garnet supplies nearly continuously since the 1940s. Smaller sheet-like deposits also occur in the lower reaches of 281 Gulch and Garnet Gulch where there is a marked flattening and widening of the floodplains. Garnet placer deposits in both these areas are the subject of the proposed action since they do tend to have high percentages of coarse-grained gem-quality garnet, likely due to their proximity to the source rock areas.

Controls on Placer Deposits

Numerous workers have postulated that one of the primary geomorphic controls on the location of the placer garnet deposits in the area involved the interaction of fluvial (river) systems and the lacustrine (lake) basin(s) associated with Miocene Lake Clarkia. Remnants of the lacustrine sedimentary sections now preserved in the flat valley floors, and in many unmapped terraces above the valley floors, caused the deposition of the gravels containing garnets as the gradient slowed and the fluvial systems carrying garnets from the source areas entered the lower gradient lake. In the broad valley floors of Emerald Creek, Carpenter Creek and the St. Maries River minable deposits of garnet are commonly found just above the distinctive silt-rich lacustrine strata. Locally, particularly near the ancestral pediment fans, garnet-bearing gravels are found within or below the lacustrine section as localized submarine channel or sheet-sand deposits. In the higher elevation gulch placers and in some of the lower elevation floodplain deposits the placer gravels lie directly on weathered schist bedrock.

Historical Garnet Resource Exploration and Development

It is important to understand the historical development of garnet resource development in the study area to place the proposal and the expected potential impacts of the proposed action into perspective.

The occurrence of significant quantities of garnet in and around the study area has been known since at least the late 1800s when abundant garnets were first reported by gold prospectors in the Fernwood area. Exploitation of these deposits has occurred at various intensity levels during the last 60 years with an

emphasis on small-scale gemstone collecting and large-scale placer mining for sand size garnets for use in industrial applications.

There are numerous deposits of sand-sized garnet in the vicinity of the study area. Mining for these garnet sand placers on both federal and private lands has occurred nearly continuously since the 1940s by various operators. Over the last 20 years, an average of 20 acres annually have been mined near the study area on lands under various ownerships (Draft Stars and Sands EIS Project File 2002). The most recent garnet sand placer mining on USFS lands was an operation on a 12-acre site located in the East Fork of Emerald Creek, lease number ID 25554, which was mined in 1992 and 1993 by Emerald Creek Garnet Company (unpublished BLM lease records).

Most of the past mining for garnet sands in the area has occurred in the broad floodplains of the lower reaches of the East and West forks of Emerald Creek. In narrower areas, the high-grade concentration of garnets can make up for the decreased aerial extent. The recent reclamation, both in the narrow and broad stream valleys, has been successful; and in some cases, damage from past mining was corrected when the area was re-mined.

In the past, before active management practices were implemented, unauthorized digging for gemstone garnets at sites within the study area on USFS and adjacent private lands developed into a chronic administrative and law enforcement problem. In 1973, an administrative closure was applied to lands within and surrounding the study area in order to prohibit unauthorized collection of gemstone garnet on USFS system lands. An organized USFS public recreational collecting program was implemented. Further description of this public recreational collecting program can be found in the Recreation Section of this EIS.

Western Garnet International, Inc. (WGC) currently owns and operates a large active commercial industrial garnet sand placer mining and milling operation in the Emerald Creek drainage basin. WGC supplies approximately 10% of the world industrial garnet supply off of private, State, and National Forest lands in the Emerald Creek area (personal communication, Jim Evans, USGS, 2005). The garnets are valuable as a specialty abrasive because they are hard, non-toxic, non-radioactive, acid resistant, recyclable, and generate minimal dust when blasted. Approximately 70% of WGC sales are comprised of this specialty abrasive market with applications such as abrasive blast cleaning of U.S. Navy ships and submarines where a non-radioactive abrasive is essential. Other major applications for the garnets produced by WGC include high temperature deep oil well packing, water filtration media, and water jet cutting abrasive (WGC website, 2005).

Details of Past Exploration and Development Activity in the Study Area by Drainage

This section describes the past known historic mining and development activity in the East Fork Emerald Creek Study area based on a review of the earlier Draft Stars and Sands EIS project files and additional unpublished electronic data produced previously by Betsy Cunningham for the USGS and Lynn Dickman of the USFS prior to this project. Data collected during the 1960s land exchanges and purchases in the area contain little detailed information (Stenz, 1965).

Strom Gulch

There has been no organized Forest Service garnet mining operation in this drainage, but Forest Service sponsored field examinations in 1975 indicate that past (pre-1975) public digging activity had occurred near the junction of two unnamed tributaries to the trunk stream segment (unlabeled field notes, 1975; and 1975 Emerald Creek Garnet Area Progress Report, 4/1/76). Felled trees and small hand dug pits overgrown with shrubs were present at the time of the Forest Service surveys.

The earliest past exploration documented in the Forest Service files in the drainage was completed during the summer of 1975 (unlabeled field notes, 1975). Exploration work consisted of excavation and sampling of five shallow, hand dug test pits in the upper portion of the trunk drainage. The exploration work was conducted under the supervision of Ray Miller (1975 Emerald Creek Garnet Area Progress Report, 4/1/76). The 1975 progress report and field notes do not indicate whether the sampling was quantitative in nature. Three of the five test pits contained “good” quantities of coarse-grained garnet ranging in depth from the surface to three feet below the ground surface. From the notes and sketch maps it is likely the samples were

collected directly in the bottom of the stream channel or in the banks immediately next to the stream channel (PF: M-4, p. 34 sample numbers prefixed with “SG”).

A more recent examination of the Strom Gulch drainage was completed in the fall of 2002 and spring of 2003 and consisted of foot traverses and panning of floodplain gravels and stream bank deposits from the junction of Strom Gulch upstream approximately one mile. The lower reach of Strom Gulch is a narrow (one to two feet wide), high gradient stream (~25%) which runs entirely on hard, massive, blocky quartzites for nearly 900 feet and the only potential garnet resources in the lower reaches occur as small accumulations of highly fractured garnets in small bedrock-bottomed pools. Farther upstream, adjacent to the sites of previous public digging and the 1975 USFS exploration work, the drainage gradient shallows and, the floodplain widens slightly above this point. The drainage substrate is no longer bedrock, but instead consists of thin gravelly to sandy silts with abundant schist fragments. The topographic gradient changes coincide with a long linear break in slope and ancestral river terrace that trends southwest to northeast through the study area. The old test pits are overgrown with +30 year old trees and little evidence of the past exploration and prospecting remains. Small areas of hummocky topography are likely former unreclaimed prospect pits and spoil piles. Field observations and panning of the creek gravels suggests the likely source of the garnets in the trunk steam drainage are derived from several small southwest directed tributaries draining the garnet-bearing schist sequence found on the hill slopes northeast of the trunk stream. Pan concentrate samples collected above the intersections with these drainages contain considerably less and also much smaller garnets than sites below their confluence. There is currently no road or trail access to the former digging sites, although once past the lower reach an old roadbed that paralleled the channel for the majority of its length can be observed. This road is now nearly completely brushed in, but remnants are still visible in places.

Given the small resource likely to be present, steep side slopes and narrow valley and difficult access it is unlikely that recovery of the garnets in Strom Gulch could occur without significant engineering efforts.

Pee Wee Gulch

Some of the earliest Forest Service managed operations in the early 1970s occurred in the Pee Wee Gulch drainage and the original parking lot and A-Frame were located adjacent to this drainage. Based on records in the project files, reviews of historic aerial photography, discussions with local rockhounds and interviews with current and former Forest Service staff the bulk of the past digging activities in Pee Wee Gulch occurred from the creek’s junction with the East Fork of Emerald Creek approximately 1,000 feet upstream, with the majority of the public digging occurring in the active floodplain and immediate banks. The most recent activity was located in a small tributary on the southwest side of the main trunk drainage about 1/4 mile upstream.

Forest Service management at this site consisted primarily of issuance of permits and general monitoring of public rockhounding activities and to some extent reclamation via backfilling of pits with hand tools and reseeding when the drainage was open for public digging for garnet gems between 1979 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream about 1,100 feet. There are still fence posts, old bridge planks and other remnants of the mining activity in the stream. Anecdotal information from interviews with local rockhounds suggests that the drainage was a popular “guerilla” dig site prior to implementation of Forest Service management activities.

The earliest past exploration documented in the Forest Service files in the drainage was completed in September 1973 and documented in the Progress Report, Mineral Resource Inventory, Emerald Creek Garnet Area authored by D.E. Hintzman and dated 6/10/74. This report indicates two test pits were excavated in Pee Wee Gulch, but their locations are not indicated in the report. More comprehensive testing work was completed on August 4, 1975 as indicated in the 1975 Emerald Creek Garnet Area Progress Report, authored by Terry Ellsworth and dated 4/1/76 (see also unlabeled field notes, 1975). The 1975 exploration work consisted of excavation and sampling of nine test pits starting just below the confluence of the first major east-draining tributary to the trunk and upstream for several thousand feet. The field work was conducted under the supervision of Ray Miller (Ellsworth, 1976). The 1975 progress report and field notes do not indicate whether the sampling was quantitative in nature. Four of the nine test pits contained “good” quantities of coarse-grained garnet and one contained “fair” quantities of coarse-grained garnet ranging in

depth from two feet to five feet below ground surface. One test pit reported "sand and slivers" and two others reported no garnets. From the notes and sketch maps it is likely the samples were collected directly in the bottom of the stream channel or in the banks immediately next to the stream channel (PF: M-4, p. 34 with the prefix "PW").

A more recent examination of the Pee Wee drainage was completed in the spring of 2003 and consisted of foot traverses and panning of floodplain gravels and stream bank deposits from the junction of Pee Wee Gulch with Emerald Creek upstream for approximately one mile. Pee Wee Gulch is a small stream averaging less than three feet wide which meanders through a small floodplain valley bottom that varies from 10 to 30 feet wide. It is narrowest at the bottom and abruptly widens as the modern stream incises through the land where the ancestral terrace deposits occur. There is currently no road and only a steep, densely vegetated hillside foot trail to the former digging sites, although once past the lower narrow reach remnants of an old roadbed within and parallel to the floodplain can be observed in places. Evidence of old digging can be observed along the steep banks of the main trunk drainage from its confluence with the East Fork Emerald Creek upstream to the junction with the southwestern tributary and on upstream in the tributary for several hundred feet. This includes irregular areas containing hummocky topography, composed of small hand dug pits and occasional piles of washed gravel now revegetated along the banks. Evidence of past digging activities in the stream bottoms is relatively rare, since after 30 years most of the damage has been leveled by ongoing stream processes and now covered with dense vegetation. Due to the extensive past digging in the drainage, dense vegetation and lack of a readily accessible excavator access route to the upper reaches of the drainage, no excavator testing was completed in Pee Wee Gulch.

Because of the extensive past recovery of the resource in Pee Wee Gulch there appears to be little likelihood of a significant deposit at shallow depths.

No Name Gulch

No Name Gulch was opened for public digging by the USFS for garnet gems from 1974 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream for about 700 feet. At this point the stream forked, approximately another 1000 feet of stream up the southwest fork and approximately 500 feet up the northeast fork were mined. Much of the disturbance from the activity in the main trunk drainage was reclaimed in the 1980s by the Forest Service, but the area in the southwest fork has extensive remains of past digging including large pits and in-stream stockpiles. There is an old road that parallels the channel for about the lower ¼ mile of stream and according to the historic aerial photos (1937) the road bed continued up the left fork of No Name Creek. The road is still evident in places along the stream bottom. The stream is small averaging less than three feet wide within a floodplain ranging between 50 feet in the trunk stem to narrowing to less than 10 feet in the lower and upper tributary reaches.

The earliest exploration documented in the USFS files in No Name Gulch was completed in 1973 with excavation of approximately 30 test pits. In 1974, an additional 39 test pits were excavated as documented in the (Hintzman, 1974). Additional test work was completed in August, 1975 and reported in 1975 and 1976 (Ellsworth, 1975 and 1976). The 1975 exploration work consisted of excavation and sampling of 12 more pits. Sample sites from the 1970s testing phases are shown on a map in the project file (PF: M-4, p.34 with the prefix "N"). Seismic surveys were also completed during the early 1970s for dam construction, although the dams apparently were never constructed. Review of aerial photographs suggests the majority of the areas tested and found to contain gem garnets in the early 1970s were eventually dug by the public in subsequent years.

Recent test work in the drainage consisted of excavation of 13 test pits in 2003 with an excavator. Testing confirmed that most of the lower reaches of the main trunk stream and northeast tributary have been extensively worked out. Small accumulations of good quality gem garnets still exist in the southwest tributary upstream of the junction with the main stem, however, the volumes and grades of the material were less than that in Garnet Gulch and clearly have already been worked once based on the occurrence of trash and disrupted stratigraphy within most of the trenches. The garnet-bearing gravels range from one to eleven feet below ground surface and range from 0.3 to 5 feet thick. The thicker intervals appear to be in places where old stockpiles were left in the drainage from bank excavations. The deposits are found as lenses of gravelly sands within a thick section of white to black reduced sandy silts and silty sands. Hand samples taken from

the undisturbed banks in the vicinity of the best gravels indicates there is additional potential for gravels in the uplands in this area, as the gravels appear to trend into the steep slopes for a considerable distance. However, potential access to these sites would be extremely difficult and the potential lies in areas of relatively steep slopes and no further exploration work was proposed due to the access and slope conditions. It is possible that during rehabilitation work recovery of some of the remaining resource could be implemented under highly controlled conditions.

Garnet Gulch

There has been no organized Forest Service garnet mining operation in this drainage, but a review of the historical files and anecdotal information about mining in the Emerald Creek area reports that unregulated rock hounding did occur in this drainage (unlabeled field notes, 1965; 1975 Emerald Creek Garnet Area Progress Report, 4/1/76; and “Early mining of Emerald Creek”, dated March 12, 1991). Maps for the area generated in the late 1970s indicate that the large pond in the central part of the Garnet Gulch floodplain deposit was a man-made feature. Discussions with members of local rockhound organizations imply the pond was actually a wash pond for material excavated by hand tools upstream several hundred feet. A number of small pits and excavations located along a stream side terrace approximately eight feet above the modern floodplain and several hundred feet upstream of 2003 test pit site GG-03-01 are consistent with these reports.

The earliest past exploration documented in the Forest Service files in the drainage was completed on August 26, 1965 (unlabeled field notes, 1965). Exploration work consisted of excavation and sampling of eleven test pits with three near the mouth of the drainage and the remainder located approximately one mile upstream (PF: M-4, p.34). The work was conducted under the supervision of Jim Preston and Kelly Lancaster from the Special Fire Squad based out of the Clarkia Work Center (unlabeled field notes, 1965) and was likely conducted as part of land exchange reviews summarized in unpublished Mineral Potential Reports prepared by Certified Mineral Examiner John Stenz for the Potlatch Land Exchange (Stenz, 1968, 1969). Additional testing was conducted in the summer of 1975 and on July 25, 1978, but no data is available indicating the location or results of this testing (unlabeled field notes, 1975; 1975 Emerald Creek Garnet Area Progress Report, 4/1/76; unlabeled field notes, 1978).

Recent test work included the excavation and sampling of 16 test pits with an excavator between 2003 and 2004, two hand dug test pits, and approximately 80 hand auger samples between 2003 and 2004. Garnet-bearing gravels occur in a sheet-like deposit overlying shallow bedrock ranging in depth from 3 feet below ground surface to as deep as six feet below ground surface in the floodplain trending into the northwest slope under a cover of finer-grained silts and sandy silts. Gravels on the terrace under these silts become more cemented and weathered out of the floodplain to the point where the garnets are unrecoverable. Please see the discussions under Alternatives Eliminated from Detailed Study in Chapter 2 for a more complete discussion of the cementation and recovery issues with these terrace deposit-hosted garnets.

Garnet Gulch presents the best opportunity for development of a long-term garnet recreation site because it contains the largest quantity and highest quality garnets in the analysis area. In addition, the site’s geotechnical and hydrologic characteristics are the most suitable for an environmentally friendly site development plan.

281 Gulch

The Forest Service has operated a recreational garnet mining operation in the 281 Gulch drainage since 1985 and has continued to the present. Formal managed activity began at the upper ends of the west and east forks and has been working progressively downstream. Currently operations are occurring a short distance upstream of the confluence of the East and West Forks. The current operating season is from July 1st (East Fork) and Memorial Day weekend (West Fork) until Labor Day weekend. During the extraction season the water is diverted through pipes past the areas of public digging. Settling ponds have been constructed below the mining activity on both forks to reduce the amount of sediment that continues downstream.

The earliest documented exploration work in 281 Gulch in the USFS files indicates at least seven test pits (PF: M-4, p. 34) were excavated in 1975 (Ellsworth, 1975) along with seismic surveys. Subsequent testing

occurred periodically throughout the mid- to late 1990s as part current operations, but these areas have since been mined out by public diggers.

Recent testing includes excavation of four excavator test pits in 2004 and twelve in 2005 concentrated in the main trunk drainage floodplain and adjacent terrace along the east banks below the confluence of the east and west forks (Appendix H: Map 5). Data indicates that the top of the bedrock surface beneath the stream sediments abruptly drops adjacent to and just below the confluence of the two drainages probably reflecting significant paleorelief. This down warp in the bedrock surface is thought to represent an older channel feature trending oblique to the modern drainages, but parallel to the current trend of the East Fork of Emerald Creek. Although not definitive, evidence suggests that a small terrace or bench may have formed along this northeast-southwest trending feature which then later formed a lake or backwater causing a placer trap to form. This feature trends completely across the study area and areas of old historic garnet digging are aligned and almost entirely restricted to within the feature which is clearly evident on slope maps (PF: M-4, p. 36).

The lower reach of 281 Gulch contains a significant gem garnet resource that is second only to Garnet Gulch in garnet quality and quantity. Because the existing infrastructure is already in place, it is the most logical place to develop additional recreational activities in the immediate future.

Details of Current Garnet Development Activity within the Study Area

Current development activity is restricted to two small stream bottom excavation sites located in the East and West Forks in 281 Gulch respectively. A description of the current garnet extraction practices is given in the Recreation Section in Chapter 3.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Alternative A

As outlined in Chapter 1, Alternative A would entail continuation of the Emerald Creek Garnet Area, utilizing modified operating methods, until the available resources in 281 Gulch are depleted followed by closure of the public recreational site and reclamation of existing disturbances and removal of site infrastructure.

The effects of the closure and reclamation of the site would have a number of direct, indirect and cumulative effects including:

1. The gem garnet resource would remain intact in Garnet Gulch and not be removed, but could be available for later recreational activities or commercial resource extraction.
2. Site closure would mean the loss of the only publicly-operated recreational gem collecting site for the Star Garnet, the Idaho State gem within the State of Idaho.

Alternatives B and C

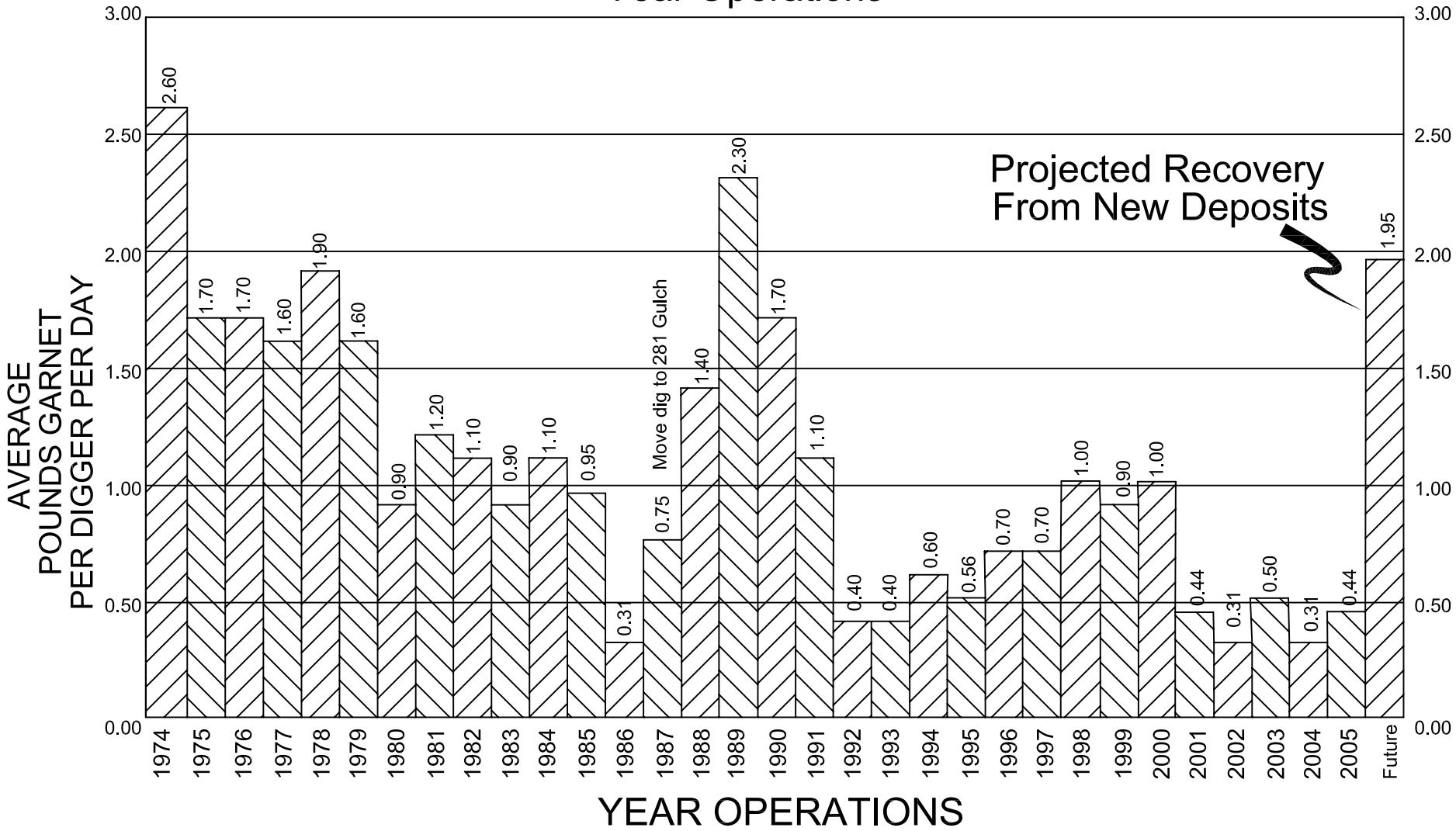
Compared to the past operations methods and Alternative A the bulk of the gem garnet resource would be extracted if Alternative B or Alternative C were implemented. There would be less chance of haphazard recovery of the gem resource. Past records from 1974 through the present indicate that the average rockhound recovered close to 0.8 pounds of garnet per day over the record-keeping period. Recently the quantities of recovered garnet have declined significantly (2005 average was 0.4 lbs per digger per day) due to the greater depths and more difficult digging conditions. Based on the bench-scale flume test conducted in the fall of 2005 and garnet gravel grade calculations made for this study, the quantities of recovered garnets are predicted to return to historically higher levels (Figure 15).

In addition, if Alternatives B or C are implemented there would likely be a detrimental impact on any attempts in the future to extract and recover any potential finer-grained industrial-gem placer deposits that might exist in the operations areas since the proposed gemstone extraction and flume-washing processes will likely reconcentrate and relocate the sand-size garnets from their original locations within the drainage system

making exploration and recovery of any resource more difficult. However, it is likely that this would have a negligible effect on the overall reserves for industrial garnet sands in the area as the drainages under consideration for recreational gem extraction tend to contain much smaller sand resources than the large floodplain deposits in the trunk drainages of Emerald Creek and the St. Maries River. Implementation of Alternatives B or C would have a direct negative effect on any future gem garnet leasing because the resources would be irretrievable.

Figure 15

Garnet Recovered (pounds per digger per day)
versus
Year Operations



NOXIOUS WEEDS

Regulatory Framework

The Idaho Panhandle National Forests, Forest Plan (USDA 1987) and Forest Service Manual (Chapter 2080, as amended, 1995) prioritize weed treatments and state that noxious weeds will be controlled with an integrated pest management approach. In addition, the Idaho Panhandle Forest Plan and the Federal Noxious Weed Act of 1974 as amended requires cooperation with State, local, and other Federal agencies in managing and controlling noxious weeds. The state of Idaho also requires landowners to control weeds on their property under the Noxious Weed Act, Title 22, Chapter 24 Idaho Code.

Analysis Area

The geographic scope of analysis of direct, indirect, and cumulative effects for noxious weeds in this project is the Emerald Creek Garnet Area Project Area (approximately 780 acres). This is the largest area upon which a meaningful analysis can be done. Weed populations may expand beyond the project area boundary, but the extent to which this would occur within the time scale of the project is unknown. Many areas outside of the project area that would be suitable for weed colonization already have weeds.

Analysis Methods

The St. Joe Noxious Weed Project FEIS (USDA 1999) lists 34 undesirable species that can be targeted for treatment and their level of infestation on the St. Joe Ranger District (Noxious Weed List for the St. Joe Ranger District and the First Recorded Occurrence in Latah County, PF: B-1). Disturbed areas often translate into potential weed habitat. Weed species are adept at colonizing recently disturbed areas particularly if light levels increase. Once established, species can grow and spread quickly and effectively exclude native vegetation from the site. Project activities will vary in the extent to which they will result in disturbance. Road construction results in a major disturbance that can be long-term. On average, road construction/ reconstruction results in 5.6 disturbed acres per mile (see Emerald Resource Unit EIS support information, PF: B-2). Trail construction, although ground disturbing, may promote weed invasion very little if canopy cover remains high. Both roads and trails may serve as corridors for weed travel. Recreational digging (previous methods) and proposed future methods as well as testing would also result in ground disturbance.

To assess effects of project activities on potential weed establishment and spread, the amount, duration and severity of ground disturbance, and the risk of weed colonization (includes proximity to existing weed populations, spread vectors, and susceptibility of the habitat) are examined.

Affected Environment

Noxious weeds are plant species that have been officially designated by federal, state or county officials. The Federal Noxious Weed Act of 1974 defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock or the fish and wildlife resources of the United States, or the public health" (P.L. 93-629). The Idaho Noxious Weed Law definition is any exotic plant species that is established or that may be introduced in the State, which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses and is further designated as either a State wide or County wide noxious weed (Idaho Code 24 Chapter 22). Both federal and state definitions pertain primarily to competition with commodity land uses, although, weeds also impact non-commodity resources such as water quality (Lacey et al. 1989), wildlife (Rice et. al. 1997, Harris and Cranston 1979), rare species (Pimental et. al 2005) and natural diversity (Forcella and Harvey 1983; Tyser and Key 1988; Williams 1997).

Historic Condition

Historically, it can be assumed that there were no noxious weeds within the project area. The weeds included in the St. Joe Noxious Weed Project FEIS (USDA 1999) for treatment on the St. Joe Ranger District originate in Europe and Asia. Before widespread human disturbance, travel, and commerce seed sources were not available for these plants. The first recorded sightings in Latah County of several currently established weed species on the St. Joe Ranger District Noxious Weed List (yellow toadflax and Canada thistle) date from the early 1900s (Noxious Weed List for the St. Joe Ranger District and the First Recorded Occurrence in Latah County, PF: B-1). However, it is unknown when weeds first appeared in the project area. Prior to the 1900s, European settler activity was limited in the watershed. In the 1910s and 1920s the watershed was logged extensively, but logs were mainly moved out of the area through splash dams and railroads down the West and East Forks of Emerald Creek. Aerial photos from 1933 show that most of the trees had been removed from the project area and that many of the major roads present today in the area were present in some form. After World War II, road construction rates rose dramatically (Transportation Report for Emerald Resource Unit EIS PF: B-3). It is likely that any weed invasions would have begun around this time.

Existing Condition

The St. Joe Geographic Assessment (USDA 1997) indicates that weeds within the project area are likely present in recently disturbed areas and roads. The full extent of weed infestations within the project area is unknown. Inventories completed for the St. Joe Weed EIS (USDA 1999) indicate the presence of spotted knapweed (*Centaurea biebersteinii*), meadow hawkweed (*Hieracium caespitosum*), sulphur cinquefoil (*Potentilla recta*), and common tansy (*Tanacetum vulgare*) within the project boundary (Noxious Weeds EIS control totals, PF: B-4). Oxeye daisy (*Leucanthemum vulgare*), St. John's wort (*Hypericum perforatum*), and Canada thistle (*Cirsium arvense*) were also noted during more recent visits to the project area. Weeds are most prolific along the 447 road, but all of the drainages have some weeds in open areas.

Weeds were treated in the project area manually and through herbicide spraying in 1999 and 2002. Herbicide spraying was conducted in the vicinity of the project area in 1999, 2000, 2002, 2003 and 2004. Biological control agents for spotted knapweed were released within the Emerald Creek Grazing Allotment in the spring of 2001. Future weed treatments would be conducted in accordance with the St. Joe Noxious Weed Control FEIS (USDA 1999).

The St. Joe Geographic Assessment priority matrix (Appendix A, page 106E, PF: B-5) identifies Emerald Creek Landscape Analysis Area as having established weed populations present with "no realistic opportunity for changing broad landscape pattern". Management of established weeds would focus primarily on limiting their spread and secondarily on reducing infestation levels.

Susceptibility parameters provided by Rice and Toney (1997) allow the calculation of acres susceptible to invasion by meadow hawkweed (one of the currently established weed species in the project area) following disturbance. Queries of the Timber Stand Management Record System (TSMRS) were conducted using the habitat parameters for each of five species provided by Rice and Toney. The results provide a coarse filter of stands that would be susceptible to weed invasion following disturbance (Table 17). All of the stands within the project area would be susceptible to invasion by all five species according to the parameters supplied by Rice and Toney.

Of the five species, only meadow hawkweed is currently known to be in the project area. Meadow hawkweed is an aggressive species, but the impacted areas would be susceptible to a host of other weed species also. Of the approximately 780 acres in the project area, only a much smaller proportion would be subject to ground disturbing activities.

Table 17 - Coarse Filter Areas Susceptible to Weed Invasion After Disturbance

Tansy ragwort	780	100
Meadow hawkweed	780	100
Orange hawkweed	780	100
Rush skeleton weed	780	100
Yellow starthistle	780	100

Environmental Consequences

Effects Common to All Alternatives

The direct effect of ground-disturbing activities on noxious weeds is to increase the area available for weed colonization. Indirect effects of project activities could be the possible establishment of new weed populations or the expansion of existing populations into newly disturbed areas.

Effects associated with weed population enlargement may include: declines in the palatability or abundance of wildlife and livestock forage, declines in native plant diversity, reductions in the aesthetic value of the landscape, encroachment upon rare plant populations and their habitats, potential reductions in soil stability and subsequent increases in erosion (Lacey et al., 1989), and an overall decline of ecosystem health.

The potential for the spread of existing noxious weeds and the introduction of new species exists for all alternatives. Established weed populations along right-of-ways and water courses on National Forest lands may provide a source of seeds for infestation of other ownerships (and vice versa). The possibility for weed establishment can be roughly correlated to the amount of ground-disturbing activity and increases in light levels that would take place. Existing populations of weeds would probably continue to spread due to seed transport by vehicular traffic, cattle, wildlife, and other natural dispersal methods if available colonization sites were available. Design features would minimize this threat. Weed control activities within these areas would be scheduled as funding and other priorities allow. Weeds would be treated in the project area on newly disturbed soils and adjacent areas following direction in the St. Joe Noxious Weed Control Project EIS (1999). Without associated weed control methods, weed species can be expected to colonize post-disturbance areas.

Alternative A

Direct and Indirect Effects

Under this alternative, recreational garnet collecting would continue in 281 Gulch. Tree canopy would not removed and the extent of the disturbance would be limited to around 200-300 linear feet a year, followed by rehabilitation. Potential exists for some colonization due to human foot traffic in and out of the area, cattle use, and established weeds in disturbed areas. However the shaded nature of the site and the immediate yearly rehabilitation limit this likelihood. Rehabilitation work will commence within a few days of ground disturbance and 100% ground cover (vegetation and mulch) would be established in the first year (see Monitoring, Chapter 2). Existing populations of weeds within the project area are expected to persist along roads and in open, disturbed areas due to more frequent disturbances and higher light levels than in surrounding forest stands. Here they would provide a seed bank for future weed infestations. Overall, weed numbers may increase slightly due to new disturbance and potential for transport.

Cumulative Effects

Cumulative effects are the result of past, present and future activities within the project area. Current and reasonably foreseeable actions such as grazing and recreational use including garnet removal may result in

the creation of new habitat for or transport of noxious weeds. It is expected that the small scale of activities, built in design features and the possibility of weed treatments would help to control the spread of noxious weeds. Overall, the effect of all activities is expected to result in either static levels (because of the very small area to be disturbed and quick rehabilitation) or a slight increase (because of ground disturbance and weed vectors) in weed numbers within the area over time, especially if control methods are not employed.

Alternative B

Direct and Indirect Effects

Ground-disturbing activities that would occur under Alternative B include garnet removal and testing in 281 Gulch and Garnet Gulch; restoration of No Name Gulch, Pee Wee Gulch and 281 Gulch; and construction of an access road with parking area for the operations in Garnet Gulch. The amount of disturbance due to garnet removal (panels, stockpiles, operations, parking lot, and road construction) to occur under this alternative would be approximately 13.6 acres over the life of the project (Disturbance Associated with Project Activities, PF: B-14). Restoration activities may occur over approximately 4,248 linear feet of stream with about 1.75 acres of parking lot and road restoration (Disturbance Associated with Project Activities, PF: B-14). Disturbance associated with garnet removal and testing would occur over a small area and rehabilitation would commence within days providing less of an opportunity for weed colonization. Design features for restoration activities in No Name and 281 Gulches are also expected to minimize the opportunities for weed colonization. Road and parking lot construction would provide the greatest opportunity for weed establishment due to the long-term disturbance and higher potential for weed seed transport.

Cumulative Effects

Cumulative effects are the result of past, present and future activities within the project area. Current and reasonably foreseeable actions such as grazing and recreational use, including garnet collecting, may result in the creation of new habitat for or transport of noxious weeds. Design criteria exist to limit the spread of weed seed and establishment of new populations, but cannot be guaranteed of 100% success. In addition, weed control as outlined in the St. Joe Noxious Weed Control EIS projects may potentially occur and could reduce the extent of existing weed populations. Activities associated with this project may contribute to a net increase in weed populations within the project area but any extent is expected to be small. Increases in light levels can play an important role in allowing weed establishment. Operations are not expected to result in large increases of light levels, and restoration activities are expected to decrease canopy openings.

Even under the No-Action Alternative weed populations are expected to remain stable at best. The overall effect of all activities is expected to result in the gradual increase in weed numbers within the area over time if control methods are not employed. Such increases may not be discernable within the time frame of this project, given the generally limited amount of annual disturbance.

Alternative C

Direct and Indirect Effects

Alternative C differs from Alternative B only in the fact that motorized access would be permitted for all collectors under Alternative C and a larger parking lot would be constructed to accommodate the additional vehicles. This would result in an additional two acres of ground disturbance. It would also create greater opportunities for weed seed transport of both established and new invader weed species by vehicles along the road.

Cumulative Effects

Although Alternative C would result in more ground disturbance, it is not expected to show cumulative effects appreciably greater than those in Alternative B. There would be two additional acres available for weed colonization and such colonization may occur faster due to the more extensive vehicle travel. In considering the project area as a whole, two acres is a negligible difference.

Forest Plan Consistency

According to the Idaho Panhandle Forest Plan (1987) direction, infestations of many noxious weed species, including spotted knapweed, meadow hawkweed, and goatweed are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established. The provisions for minimizing weed spread in Chapter 2 would meet this goal. The No- Action Alternative would also meet the intent of the Forest Plan.

Idaho Noxious Weed Act

Noxious weeds would be controlled under all alternatives (Design Features G.1.-8.)

OLD GROWTH

Direction in the Forest Plan (page II-5) states that "Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old growth dependent and management indicator species. To obtain the desired distribution, the IPNF will be managed to maintain approximately 5 percent of each old-growth unit as old growth where it exists." As part of a Forest-wide process the District(s) identified stands meeting old growth criteria. Stands were then allocated to old growth management to comply with Forest Plan standards.

The Forest Plan standards related to old growth are found in the Forest Plan (page II-29). Forest Plan standard *10a* incorporates the definitions of old growth developed by the Regional Old Growth Task Force, documented in *Old-Growth Forest Types of the Northern Region* (Green et al, 2005). In compliance with Forest Plan old growth standard *10a,* the validation process for the Emerald Creek Garnet Area project used the definitions as outlined in this Regional old growth guide (PF: OG-1). Compliance with standards *10b-i* is discussed later in this report.

Analysis Methods

Analysis of old growth is done on the total Old Growth Management Units (OGMU) that is totally or partially within a project area. The old growth analysis area for the Garnet project is OGMU #5 (St. Maries, 04). This is appropriate for this project because the project area is entirely within this OGMU, and all activities associated with this project would be confined within this old growth management unit.

The old growth validation process for the Garnet analysis is documented in the project file (PF: OG-2). This validation process used the minimum criteria for each old growth type, by appropriate habitat type group, as displayed in the Regional old growth guide (PF: OG-1) to validate whether stands meet old growth criteria. The three stand characteristics used in the Regional old growth guide used to display the minimum criteria are; (1) Minimum age of large trees, (2) Number of trees per acre equal to or greater than a given DBH level and age, and (3) Minimum basal area of trees $\geq$5 inches DBH.

Using the Timber Stand Management Reporting System (TSMRS) database, stands currently classified as old growth were identified within OGMU #5 (St. Maries, 04). The TSMRS database was reviewed in October of 2005. All acres should be considered approximate due to such factors as rounding, scale of analysis, delineation and procedural variance between resources evaluating old growth. These differences are insignificant related to evaluating the current status of old growth in this proposal.

No stands identified as allocated old growth, nor any stands known to meet the minimum criteria as old growth, are proposed for activity in the Garnet project.

Affected Environment

The proposed Garnet project is located entirely within OGMU #5 (St. Maries, 04). This old growth management unit (OGMU) is approximately 8,566 acres in size. The current old growth allocation within this

OGMU is 1,372 acres, or 16.02%. A map displaying the old growth allocation is contained in the project file (PF: OG-3). Validation and monitoring of old growth is an ongoing process. No project associated activity is proposed in stands that are known to meet the minimum criteria for Old Growth. Currently, no allocated old growth is located in the Emerald Creek Garnet Area Project Area. The stands where activities are proposed do not meet the minimum criteria for old growth.

Environmental Consequences

ALTERNATIVE A

Direct, Indirect and Cumulative Effects

There would be no direct/indirect and cumulative effects resulting from the No-Action Alternative on either existing allocated old growth or additional stands meeting old criteria. Forest Plan standards for old growth retention would continue to be met. The stands where activities are proposed do not meet minimum criteria for old growth (PF: OG-2).

There would be no direct or indirect effects from current and reasonably foreseeable activities including weed control, road and trail maintenance, and public recreation (i.e. berry picking, hiking, hunting, wood gathering and similar activities. Only very small incremental cumulative effects, if any, on allocated old growth is expected as a result of these other activities.

ALTERNATIVES B &C

Direct, Indirect and Cumulative Effects

No road construction, excavation or other activities are proposed within allocated old growth. There would be no direct/indirect or cumulative effects resulting from the Alternatives B and C on existing allocated old growth. Forest Plan standards for old growth retention would continue to be met. The stands where activities are proposed do not meet minimum criteria for old growth (PF: OG-2).

There would be no direct or indirect effects from current and reasonably foreseeable activities including weed control, road and trail maintenance, and public recreation (i.e. berry picking, hiking, hunting, wood gathering and similar activities). No cumulative effects on allocated old growth are expected as a result of these other activities.

Consistency with Forest Plan and Laws

Old growth standard 10a in the Forest Plan states: “A definition for old growth is being developed by the Regional Task Force and will be used by the Forest when completed.” In compliance with Forest Plan old growth standard 10a, the definitions of old growth developed by the Regional Old Growth Task Force, documented in Old-Growth Forest Types of the Northern Region (Green et al, 2005) have been incorporated into Forest Plan standard 10a and were used in the validation and analysis process of old growth in this project.

Old growth standard 10b in the Forest Plan directs that we “Maintain at least 10 percent of the forested portion of the IPNF as old growth.” The Idaho Panhandle National Forest is meeting Forest Plan standards for old growth with 12.1% of forested acres to be retained as old growth, as disclosed in the Old Growth section for the 2004 IPNF Forest Plan Monitoring Report (PF: OG-4).

Old growth standard 10c in the Forest Plan states: “Select and maintain at least five percent of the forested portion of those old-growth units that have five percent or more existing old growth.” The proposed Garnet project is located entirely within OGMU #5 (St. Maries, 04). This old growth management unit (OGMU) is 8,566 acres in size. The current old growth allocation within this OGMU is 1,372 acres, or 16.02%. OGMU #5 (St. Maries, 04) meets this Forest Plan standard.

Old growth standard 10d states: “Existing old-growth stands may be harvested when there is more than 5 percent in an old-growth unit, and the Forest total is more than 10 percent.” No disturbance activities are proposed in either allocated old growth or in additional stands identified as meeting old growth criteria within the project. This proposal is in compliance with old growth standard 10d.

Old growth standard 10e states: “Old growth stands should reflect approximately the same habitat type series distribution as found on the IPNF.” Compliance with this Forest Plan standard is disclosed on page 72 in the 2004 IPNF Forest Plan Monitoring Report (PF: OG-4).

Old growth standard 10f describes desirable patch size stating: “One or more old-growth stands per old-growth unit should be 300 acres or larger…..The remaining old-growth management stands should be at least 25 acres in size. Preferred size is 80 plus acres.” In OGMU #5 (St. Maries, 04), the allocated old growth occurs in 8 patches distributed throughout this OGMU. These patches range in size from 30 to 384 acres, and average approximately 176 acres. Within this OGMU there are eight patches greater than 25 acres, with six of those being greater than 80 acres in size. Of the patches greater than 80 acres, there is one patch greater than 300 acres. OGMU #5 (St. Maries, 04) is in compliance with old growth standard 10f as discussed above. A map identifying old growth patches and their relative area is included in the project file (PF: OG-3).

Old growth standard 10g states: “Roads should be planned to avoid old-growth management stands to maintain unit size criteria.” All road and trail construction planned in this project is located within stands that are not allocated as old growth and/or do not meet the minimum criteria for old growth (PF: OG-2). This proposal is in compliance with old growth standard 10g.

Old growth standard 10h states: “Existing grazing allotments will be honored;…New allotments in old-growth will not be issued.” No new grazing allotments are proposed. This proposal is in compliance with old growth standard 10h.

Old growth standard 10i states: “goals for lands to be managed as old-growth within those lands suitable for timber production are identified in the management area prescriptions.” The Idaho Panhandle National Forest is meeting Forest Plan old growth standards for management area designation as disclosed on page 72 in the 2004 IPNF Forest Plan Monitoring Report (PF: OG-4).

Specific goals, objectives and standards for old growth management as described in the Forest Plan on pages II-5 and II-29 are met with the proposed action. The Proposed Action Alternative is consistent with the Forest Plan for the management of old growth.

RANGE

Regulatory Framework

Direction for the management of the range program on Forest Service lands is provided for in several regulations, policies, and laws including: Idaho Panhandle National Forests Forest Plan (USDA 1987), The National Forest Management Act (1976); The National Environmental Policy Act (1969, as amended); Forest Service Manual Chapter 2200, as amended (USDA 1990); The Multiple use-Sustained Yield Act (1960); The Federal Land Policy and Management Act (1976, as amended); The Endangered Species Act (1973, as amended); and The Clean Water Act as amended by the Water Quality Act of 1987 (U.S. Congress 1988).

Analysis Area

The geographic scope of analysis for range issues in this project encompasses the Emerald Creek (26,352 acres) allotment. Acres were derived from GIS.

Analysis Methods

Information was collected from Allotment Management Plans, historic grazing records, permittee files, and the Environmental Assessment for the St. Maries Grazing Allotments (USDA 2004).

Existing Condition

Vegetation surveys completed in 1998 (located in St. Maries Grazing Allotment EA project file) indicate that the condition of riparian vegetation in the Emerald Creek allotment has an upward trend. These surveys also show that Forest Plan and Inland Native Fish Strategy (INFS) standards for allowable trampling, level of streambank stability, and streambank vegetation coverage are being met in the allotment (PF: B-6).

Livestock primarily graze within riparian meadows and use adjacent upland areas for shade and cover. Livestock may alter riparian areas by trampling, rubbing, and browsing riparian vegetation. Removing vegetation, trampling and shearing may affect streambanks and fish habitat (Platts 1991). Monitoring for these effects will be done as described in the St. Maries Grazing Allotment Environmental Assessment (USDA 2004).

Cattle and sheep grazed in the area of the Emerald Creek allotment in the 1920s and 1930s prior to land acquisition by the Forest Service. In 1943 and 1944 sheep were the primary grazers after the Forest Service acquired the land. In 1945 cattle/horse use officially began and has become the only permitted grazing on the allotment. Permitted numbers of stock fluctuated during the early years. Permitted numbers of cattle were 400 cow/calf pairs in 1953 which changed to 368 head in 1968, changed again to 320 head in 1969, and was then reduced in 1972 to 225 head. These numbers were maintained until the Emerald Creek Cooperative Resource Management Area Memorandum of Understanding was signed in 1994. The total number of cow/calf pairs allowed in the allotment was then set at 413, with a total of 41 cow/calf pairs permitted to graze on National Forest lands. Grazing is currently permitted from June 15th to October 15th each year.

The majority of grazing occurs in the lower elevations of the East and West Forks of Emerald Creek and on Willow Creek, although some livestock follow existing roads to the Emerald Butte area and the upper portions of the East and West Fork drainages and Cedar Creek. The Emerald Creek Garnet Area Project Area does not lie within a primary grazing area. Cattle do use transitory range above the project area and have been noted at the head of Garnet Gulch. Cattle are seen annually in the current garnet area in 281Gulch.

Environmental Consequences

Alternative A

Direct, Indirect, and Cumulative Effects

Recreational garnet collecting would continue in 281 Gulch, followed by rehabilitation. In the past a few cattle have briefly used the garnet sites. In 2005, more cattle use and subsequent damage have been seen in 281 Gulch. Restoration work could be hampered by increased cattle usage. Cattle use on the allotment is regulated through an adaptive management process. Increased vigilance and increased use of a range rider is the preferable first step in addressing livestock problems. If this approach failed to work, then other approaches would be tried (see Chapter 2). What effect these actions would have on cattle movement and use in the project area is unknown.

The cumulative effects of past and present management activities as well as natural random events were incorporated into the description of existing conditions. Future events within the allotment such as timber harvest, road building, road decommissioning, or tree planting (see Reasonably Foreseeable Activities Table, Chapter 3) may open up new areas to grazing through forage creation or access, close some areas to grazing through forage reductions or access, and/or affect cattle movement.

Alternative B and C

Direct, Indirect, and Cumulative Effects

The Emerald Creek Allotment is comprised of approximately 26,352 acres. The primary grazing area within the allotment closest to the project area is along the East Fork of Emerald Creek. Cattle use in the project area is light due to the fact that it does not contain primary grazing areas or even transitory range created from past timber harvest. Cattle do currently use the area off of Road 1487 and transitory range in timber sale units located there. In 2005, six pairs of cattle were found to be using 281 Gulch. It is likely that they came from the harvest unit at the top of the gulch and subsequently moved down through 281 Gulch to reach the East Fork of Emerald Creek.

With the construction of the road and parking area into Garnet Gulch there is a possibility that cattle may use the road to access the site. To prevent this movement, a cattleguard would be placed at the bottom of the new road (see Design Features, Ch. 2)

Cumulative Effects

There are several reasonably foreseeable activities that may occur within the Emerald Creek Allotment (e.g. timber sales, road construction, road decommissioning, fire suppression, fuel reduction, mining). While these projects may have an effect on grazing within the allotment, none of them is in close enough proximity to the project to likely affect changes there. Future activities may affect livestock distribution due to the creation of transitory range in openings or reductions in transitory range through planting. Livestock distributions may also change due to new access provided by new roads. The movement of cattle on to newly created transitory range or to previously unusedareas due to new travel corridors could have detrimental to beneficial effects. Such movement may serve to decrease grazing pressure on riparian areas and reduce overall effects of grazing over a larger area. It may also open potentially sensitive areas to grazing that were previously unused. For further discussion of these effects refer to the St Maries Grazing Allotment EA (USDA, 2004).

Consistency With Forest Plan and Laws

Management directive states that “grazing management will protect soil and water resources, riparian areas, and T&E species” (Forest Plan II-7). The Forest Plan states that “opportunities for grazing and other uses of public range resources will be managed to serve the welfare of local residents and communities “(Forest Plan II-31). All of the proposed alternatives with requirements for adaptive management and monitoring would meet the intent of the Forest Plan.

RARE PLANTS

Introduction

Ground-disturbing activities have the potential to impact Endangered, Threatened, Proposed, and Sensitive (TES) plants. Effects on population viability from disturbance events (natural or human-caused) are hard to quantify with certainty for all TES plant species and species of concern. Specific knowledge of population biology and species ecology is not yet known for several species, particularly the sensitive moonworts and certain orchids. Much of the current knowledge regarding TES plant species is based on observational and even anecdotal information. Literature and monitoring reports for several species, including deerfern (Blake and Ebrahimi 1992), Henderson's sedge and Constance's bittercress (Lichthardt 1998, Lichthardt 2000), clustered ladies slipper (Greenlee, 1997), and Idaho barren strawberry (Crawford 1980) provide a greater understanding of the relationship of habitat disturbance to the integrity of species populations.

The risk of adverse effects on TES plants from activities varies with activity type, timing of activity, extent of activity, habitat suitability, and the species at risk. Plant surveys and mitigation measures are designed to protect populations and suitable habitat. Activities with effects that could lead to loss of population viability or trend toward federal listing would have the highest risks associated with them. Other activities may impact individual plants but are not likely to adversely affect population viability and as such are low to moderate risk activities. Small changes in the light regime, moisture levels, or moderate soil disturbance can impact individuals or populations of species dependent on specific successional habitats, soil fungi (mycorrhizae) associations, or canopy closure. Observations and monitoring information indicate that some activities may have little, or even positive, effect on some species such as deerfern (Blake and Ebrahimi 1992) and Constance's bittercress (Crawford 1980).

The purpose of this analysis is to determine if alternatives will adversely impact TES plants that may occur in the Emerald Creek Garnet Area Project Area, to insure that the alternatives do not contribute to loss of rare plant population viability, and to insure compliance with Forest Service and other federal policies. This analysis discusses the current status and distribution of known rare plant populations and habitat within the analysis area and how planned activities can be expected to impact them.

Regulatory Framework

Protection of plant species deemed threatened, endangered, or rare (Forest Service "sensitive") and protection for population viability is determined by federal legislation, regulations, policy, and direction. This regulatory framework includes the National Environmental Policy Act (1969); the Endangered Species Act (1973), as amended; the National Forest Management Act (1976); Forest Service manual 2672.1 - 2672.43 (USDA 1990a); Idaho Panhandle National Forests (IPNF), Forest Plan (USDA 1987); and direction from the Washington Office and Regional Watershed, Wildlife, Fisheries, and Rare Plant program.

Analysis Area

The geographic scope of analysis for rare plant species in this project is the Emerald Creek Garnet Area Project Area (approximately 780 acres, all in Forest Service ownership). Geographic scope of potential effects (direct, indirect, and cumulative) is determined by a combination of factors including: activity areas, geographic location, the scope of the proposed action, resources and species which may be present, consequences and scope of effects, and the ability to measure effects. The scope of action and potential for adverse effects determine the extent of analysis necessary. This analysis considers short and long-term management as it may affect known or suspected populations of TES plant species as well as their potential habitat.

Temporally, the effects of proposed activities on rare plants or their habitat will vary with activity. Small-scale activities with limited ground disturbance may result in brief effects. Large-scale activities may alter habitat characteristics: these effects may extend beyond the anticipated timing of activities.

Analysis Methods

Plant species can be assigned to one or more rare plant guilds, which are artificial groups based on similar habitat requirements and useful for the purpose of analysis (Mousseaux 1995). The St. Joe District's rare plant guilds are: Aquatic, Deciduous Riparian, Peatlands, Wet Forest, Moist Forest, Dry Forest, and Subalpine. Rock seeps and springs are another habitat that can support certain TES species, but they can occur across all guilds and are not identifiable at a coarse scale. A complete description of all guilds is located in the project file (PF: B-7).

Based on current information regarding preferred habitat and successional state for species within the different guilds, the District Timber Stand Management Record System indicates the amount of highly suitable rare plant habitat that may be present in the project area. In addition, site specific information from timber stand examination records, aerial photographs, topographic position, existing habitat and survey information, personal knowledge and professional judgment were used in analysis. Evaluation of known sites for TES and species of concern (SOC) plants was accomplished using District Sensitive Plant Records and Idaho Department of Fish and Game Conservation Data Center (ICDC) Element Occurrence Records.

Regional direction (Leonard, 1992) states that the need for and extent of field reconnaissance should be commensurate with the risk associated with the project and species involved, and the level of knowledge already in hand. Species presence is assumed for all highly suitable habitats and field surveys either validate or negate presence. Any occurrences that are deemed necessary to ensure species and population viability against a potential trend towards federal listing would be protected. The importance of a population is based on a variety of factors such as size of population, number of known sites, ranking, and sensitivity to disturbance. These practices are assumed to be an effective conservation strategy. Some isolated individuals or occurrences, not deemed critical to population viability, may be impacted by activities.

Surveys were conducted in Garnet Gulch, 281 Gulch, PeeWee Gulch and No Name Gulch in 2002. No habitat for *Silene spaldingii* or *Howellia aquatilis* was discovered. Field survey sheets are located in the project file (PF: B-8). In 2004 the Regional Forester issued a new Region 1 sensitive species list that identified two new species with a potential to be in these previously surveyed areas (St. Joe Threatened, Endangered and Sensitive Plants, PF: B-9). As a result, additional surveys were conducted in 281 Gulch, Garnet Gulch, Pee Wee Gulch and No Name Gulch in 2005. Surveys were conducted on potential new road and trail construction during the summer of 2005. New sites of *Rhizomnium nudum* were found in No Name Gulch, 281 Gulch, and Garnet Gulch. A new site for *Blechnum spicant* was located in No Name Gulch.

Rhizomnium nudum (Naked mnium) is a moss species that grows in woods on damp soil, humus, and near waterways. In some portions of its range it also occurs on boulders or talus at cliff bases.

Blechnum spicant (deerfern) is a fern found in moist mineral soils in dense, red cedar or western hemlock type forests. It is tolerant of some disturbance

Affected Environment

Little is known regarding the historical occurrence, abundance, and distribution of rare plants and their habitats across the analysis area. An assessment of the forest ecosystem for the St. Joe Ranger District estimated that over 20% of the geographic area had the potential to support plant species that are now of special concern (USDA 1997).

Historically, stand-replacing disturbance patterns in the St. Joe Sub-basin were large and dominated by wildfire (St. Joe Geographic Assessment pages 41-55, PF: B-10). Fires occurred adjacent to the project area in the early 1900s, but no known wildfires have occurred in the project area proper. Extensive timber harvest occurred in the early 1900's. Currently in the project area timber harvest and associated roads are the dominant stand-replacing disturbance pattern. As a result habitat fragmentation has increased, and the size of mature/old forests and forest patch size and diversity have declined.

Existing Condition

The sub-basins of northern Idaho contain varied and diverse habitats and plant communities. Of the estimated 1,200 to 1,500 plant species known or thought to occur here, about ten percent are considered

rare or uncommon. Coarse filter queries (Query for Stands with High Potential Habitat, PF: B-11) of FACTS indicate a total of approximately 758 acres of high potential habitat within the project area (648 acres of moist forest and 110 acres of wet forest). This equates to 97% of the project area. In addition, 10 acres of *Silene spaldingii* habitat were identified by a coarse filter. Field visits in 2002, however, revealed these areas to be unsuitable habitat. The project area is comprised almost completely of moist forest high potential habitat with some wet forest high potential habitat located along the western banks of Garnet and 281 Gulches. High potential dry forest, subalpine, deciduous riparian, aquatic, and peatland habitats do not occur within proposed activity areas. A list of wet and moist forest species and their habitats (Habitat Information for Species in the Moist and Wet Forest Guilds, PF: B-12) and a complete list of sensitive species and species of concern are included in the project file (PF: B-9).

Testing and recreational collecting would be confined to approximately one mile or less of each of the four drainages (281, Garnet, No Name, Pee Wee). The first mile of each drainage is contained entirely within either moist forest or wet forest high potential habitat. Areas within Pee Wee, No Name and some of 281 Gulch have experienced organized garnet digging in the past.

Currently, vegetative conditions across the St. Joe Sub-basin are characterized by smaller patch sizes created by more uniform disturbances than would be found historically due to the predominance of human-caused disturbance regimes (USDA 1997). As a result, vegetative diversity and specialized habitats have declined over historic conditions. Riparian areas also suffer more severe and common disturbances resulting in major declines in natural plant communities and habitat complexity (USDA 1997). In the St. Joe Sub-basin, nearly 60% of riparian communities have experienced intensive habitat modification. Riparian communities that contained habitat for rare plant elements are estimated to have declined by approximately 68% across the sub-basin, resulting in decreased geographic connectivity and isolation of rare plants.

Within the analysis area, significant changes to the character of the watershed have occurred within the past century and were primarily caused by timber harvest and associated activities as well as fire, grazing, mining, and the introduction of exotic species. Timber harvest along with associated road construction began in earnest in the early 1900s and accelerated after World War II. By 1933, nearly all of the timber had been removed from the project area including riparian areas.

Currently habitat types on the St. Joe Ranger District that have been heavily modified and/or are in short supply (dry forest w/ large trees, riparian and wet and moist forest habitats) compared to historical conditions are the same habitats where most rare plant species can be found. However, the majority of the remaining riparian and cedar wet and moist forest habitats to be found across the district are expected to remain stable due to protection requirements (St. Joe Geographic Assessment page 54, PF: B-10).

Federally Listed Species

There are no known sites of federally listed plants on the IPNF. The USDI Fish and Wildlife Service indicates that two species listed as threatened might possibly occur on the St. Joe Ranger District (USDI 2006). A threatened species is any that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Water howellia (Howellia aquatilis) and Spalding's catchfly (Silene spaldingii) could potentially occur on the District. Suitable habitat is suspected, but to date, there are no documented citations of these species on the IPNF.

Water howellia (Howellia aquatilis) occurred historically in the Idaho Panhandle but is believed to have been extirpated. It is an annual aquatic species restricted to small, seasonal, pothole ponds or the quiet water of abandoned river oxbows that dry up each season. Because of this restrictive habitat requirement, population numbers in a given year are directly influenced by the extent of pond drawdown at the end of the previous growing season (USDA, 1994) and are susceptible to changes in hydrology and annual weather conditions.

Spalding's catchfly (Silene spaldingii) is suspected to occur in the IPNF. Its habitat is in dry grassland habitats and grassland inclusions in ponderosa pine and Douglas-fir forest.

Sensitive Plant Species

Sensitive species, as determined by the Regional Forester (USDA 2004a), are those for which population viability is a concern. This can be indicated by a current or predicted downward trend in population numbers

or suitable habitat, which would reduce the species' existing distribution. Twenty-four of these species are known or thought to occur on the St. Joe Ranger District (St. Joe Threatened, Endangered and Sensitive Plants, PF: B-9). There are two known sensitive species (*Rhizomnium nudum* and *Blechnum spicant*) within the project area. Outside of the project area, but within two miles of the project boundary, there is one occurrence each of deer fern (*Blechnum spicant*) and least moonwort (*Botrychium simplex*) (ICDC 2004). Additional information on these species is located in the project file (PF: B-12).

Species of Concern

Along with threatened, endangered, and sensitive plants, the IPNF also tracks 23 Forest Species of Concern. Those species in the Moist Forest and Wet Forest Guilds have the potential to be within the project area (St. Joe Threatened, Endangered and Sensitive Plants, PF: B-9). These species are considered to be secure at the global, regional, and state levels, but may be at risk at the Forest level. While biological evaluations are not required to address species of concern, they are addressed in effects analysis when viability within the planning unit is an issue. There are no known sites of species of concern within the project area. Outside of the project area, but within one mile of the project boundary, there is one population of phantom orchid (*Eburophyton austiniae*) (ICDC 2004).

Environmental Consequences

Alternative A

Direct, Indirect and Cumulative Effects

There would be no known direct effects of the No-Action Alternative. No rehabilitation work would be done in No Name Gulch. Surveys did not reveal any rare plants in the areas remaining to be dug in 281 Gulch. There are three sites of *Rhizomnium nudum* located in 281 Gulch; one above and two below the current collection site. These sites would not be impacted by the recreational digging, testing or rehabilitation work to be done. Additional sites are located in three adjacent drainages and under this alternative, all of these populations are considered secure.

Indirect effects of Alternative A could result from encroachment of noxious weeds into rare plant habitat. Although weeds currently exist in the disturbed, open areas of 281 Gulch, disturbance and canopy removal would not occur near known rare plant sites. Noxious weed treatments would occur according the St. Joe Noxious Weed Project EIS (USDA 1999). It is therefore unlikely that weeds would threaten the habitat of *Rhizomnium nudum*.

Cumulatively, the effects resulting from all activities within the project area would not have a negative effect on rare plants or their habitats primarily due to the distance and small scale of planned disturbances and the presence of other rare plant sites in the project in areas not planned for disturbance.

Alternative A would have no effect on *Spiranthes diluvialis* or *Howellia aquatilis*. Surveys conducted in the summer of 2002 revealed no habitat or presence of plants within the project area.

There would be no impact to species of the Aquatic, Deciduous Riparian, Peatland, Dry Forest, and Subalpine Rare Plant Guilds because they are not present in the project area. Of the potential species to be found in Wet and Moist Forest high potential habitat, only *Rhizomnium nudum* exists in 281 Gulch. However, project activities would not impact this population and so this alternative would have no impact on the species of the Wet and Moist Forest Rare Plant Guilds.

Alternatives B and C

Direct and Indirect Effects

Alternatives B and C differ only in the fact that motorized access would be permitted for all collectors under Alternative C, and a larger parking lot would be constructed to accommodate the additional vehicles.

Nearly the entire project area consists of Moist Forest rare plant habitat with some Wet Forest rare plant habitat along Garnet Gulch and 281 Gulch (High Potential Habitat Map, PF: B-13). Surveys for rare plants

were conducted in 2002 and 2005 in areas proposed for road construction, garnet collecting and testing. Two sites of *Blechnum spicant* were located in No Name Gulch during surveys. Three populations of *Rhizomnium nudum* were located within the project area in Garnet Gulch, 281 Gulch, and No Name Gulch. An additional population of *R. nudum* was found in Strom Gulch, a drainage adjacent to the project area. It is likely that *R. nudum* can be found in other nearby drainages that empty into the East Fork of Emerald Creek. The *R. nudum* found in 281 Gulch and No Name Gulch occurs as isolated small patches. Isolated patches of the species also occur in Garnet Gulch however, this population also contains relatively large and contiguous patches.

The patches of *R*. *nudum* in 281 Gulch are located approximately 200 feet from Road 447 and 800 feet above the current site in the East Fork. None of these sites would be disturbed by proposed garnet removal, testing, or access. Woody debris placement and riparian plantings are activities proposed that could adversely affect the lower portion of the subpopulation. Restoration plans would be designed to prevent impacts to *R*. *nudum* and all sites in 281 Gulch will be retained (See Design Features, Chapter 2).

There is one population of *Blechnum spicant* with two plants located in the west fork of No Name Gulch. There is also one site of *R. nudum* along the west fork. These plants are located far enough up the west fork that they would not be impacted by potential rehabilitation work and are considered secure.

Garnet Gulch has the largest population with the most abundant concentrations of *R*. *nudum* within the project area, possibly due to the fact that it has had the least mining disturbance of the four drainages. The majority of the population occurs within 1,000 feet of Road 447 with one site above the furthest planned extent of the recreational garnet removal. Garnet removal and testing pose a threat to this population.

Recreational collecting and access would not be allowed from the bottom of the lowermost planned panel to Road 447. Five potential panels would not be used for recreational garnet collecting. There are *R*. *nudum* plants in the two lowermost panels to be dug and these may be extirpated. However, given that the soil strata would be stockpiled separately and replaced within days it is possible that *R*. *nudum* would be able to reestablish itself within these areas. The worst case scenario would be that a portion of the population within Garnet Gulch would be destroyed. However, the majority of the population would be preserved and the population as a whole would be considered secure.

The loss of a portion of the *Rhizomnium nudum* population within Garnet Gulch may be an irreversible commitment of resources. It is possible that the methods of stockpiling topsoil and the rapid rehabilitation of mined areas may allow for the moss found within the soil to reestablish at the site. However, the probability of this happening is not known, and there is no certainty that disturbed *R. nudum* would survive to reestablish. It is also not known if *R. nudum* would recolonize disturbed areas from nearby populations given that known spore dispersal distances for mosses are generally small.

Indirect effects to rare plants from Alternative B and C could result from encroachment of noxious weeds into rare plant habitat. This potential is greater in Alternative C because of the disturbance associated with the creation of the parking lot and the greater vehicular traffic along the access road. These areas would be available for treatment (see Design Features, Chapter 2). Within the project area however, ground disturbance or canopy removal would not occur in the immediate vicinity of any rare plant site with the exception of a portion of habitat in Garnet Gulch. Garnet collection areas would be monitored for new weed invasions and targeted for treatment. Without disturbance and increased light, weeds are not expected to colonize new areas and threaten rare plants.

Alternatives B and C would have no effect on *Silene spaldingii* or *Howellia aquatilis*. Surveys revealed no habitat or presence of plants within the project area.

There would be no impact to species of the Aquatic, Deciduous Riparian, Peatland, Dry Forest, and Subalpine Rare Plant Guilds because they are not present in the project area. Of those species found in the Moist or Wet Forest Guilds, only *Blechnum spicant* and *Rhizomnium nudum* are present in the project area. For *B. spicant* Alternatives B and C would have no effect. For *Rhizomnium nudum* Alternatives B and C May impact individuals or habitat but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Cumulative Effects

The cumulative effects area for TES plants and highly suitable habitat was determined to be the project area. Past activities including garnet mining, fire, road construction, and timber harvest have likely affected populations and habitat of rare plants. Design criteria for the project are considered sufficient to protect species viability of the rare plants present in the project area from proposed project activities. The loss of individual plants would not contribute to the loss of population viability. Within the project area itself, there are no foreseeable planned future activities that would have an effect on rare plants and their habitats. Activities such as unauthorized garnet digging (see Recreation, Ch. 3) do have a potential to detrimentally affect known rare plant populations. Estimations of potential damage to plant populations from this activity would be purely speculative. The project area is located within an active grazing allotment and cattle grazing is an ongoing activity. However, no cattle use has been observed at any rare plant site within the project area likely due to the forested nature and lack of easy access. This condition will not change under any alternative and cattle use is not expected to threaten rare plant sites. The cumulative effects to TES plants would be very similar in Alternatives B and C. Alternative C may pose slightly higher risks due to more of an opportunity for weed expansion and introduction of new weed species into the project area. However because this threat should be restricted to disturbed and/or high light areas, and because design features and treatment measures would be implemented, it is not expected to threaten known rare plant sites and thus the overall risks are not expected to be appreciably higher than in Alternative B.

Consistency with Forest Plan and Other Regulations

The Forest Plan states one management goal as "manage habitat to maintain populations of identified sensitive species of animals and plants" (Forest Plan, II-1). A Forest Plan standard for sensitive species is to "manage the habitat of species listed on the Regional Sensitive Species List to prevent further declines in populations which could lead to Federal listing under the Endangered Species Act" (Forest Plan, II-28). The Forest Plan also identifies the need to "Determine the status and distribution of Threatened, Endangered, and Rare (sensitive) plants on the IPNF" (Forest Plan, II-18). All of the proposed alternatives would meet the intent of the Forest Plan.

All alternatives would also meet the intent of the Endangered Species Act and the National Forest Management Act.

RECREATION

Regulatory Framework

Forest Plan

Recreation Goals as identified in the Forest Plan pages II-I &2 (PF: R-16) include:

1. Provide for the projected use of developed recreation areas. Complete the development of new sites as budget becomes available.
2. Provide for a variety of dispersed recreation opportunities.
3. Provide opportunities for people to be involved in Forest management activities and supply information enabling visitors to better enjoy National Forest lands.
4. Manage special areas for the unique qualities that precipitated their designation: i.e., Wild and Scenic Rivers, Scenic Areas, Botanical Areas, etc.

Recreation Objectives and Standards identified in the Forest Plan pages II-3 and 24 (PF: R-16) indicate, in part, that the Forest will continue to provide a share of outdoor recreation needs in relation to other public and private entities, provide for the projected use of developed recreation areas with development of new sites as budget becomes available, to provide for a variety of dispersed recreation opportunities, to pursue opportunities to increase and improve the recreation trail system, and to continue and increase cooperative trail programs with organizations, clubs, and other public agencies. Forest Service recreation programs will

strive to be complementary with other public and private programs. Off-site interpretation and environmental education will be encouraged. The current level of developed recreation facilities and opportunities will be increased. The increase will be obtained by expansion of existing sites and development of new recreation sites as budget allows. Recreation planning and operations will be coordinated with other federal, state, local, and private recreation managers.

A land use plan for the Garnet Area was also included in the Forest Plan as Appendix AA (PF: R-17). The project area is designated in the IPNF Forest Plan as primarily Management Area 4 (MA 4). This Management area direction for recreation is as follows:

> Manage primarily for roaded modified and roaded natural ROS classes. Motorized use is generally restricted to designated routes. Within critical habitat components motorized recreation use may be restricted to provide needed wildlife security. Maintain a diversity of recreation opportunities. **The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience and in accord with its current management direction** (Forest Plan, III-17-18).

Analysis Area

The geographic scope for the recreational analysis consists of the project area (approximately 780 acres) described in Chapter 1 of the EIS. Adjacent areas are included when presenting nearby recreation opportunities.

The recreation experience can be classified according to the Recreation Opportunity Spectrum (ROS) as referred to in the IPNF Forest Plan. According to the St. Joe District's current Recreation Opportunity Spectrum (ROS) inventory (PF: R-10), lands within the project area are considered Roaded Modified; this is where a modified environment predominates with some naturally appearing environment. This class is described as follows (Forest Plan, VI-28):

> The Roaded Modified ROS class is a subclass of the Roaded Natural ROS class. The Roaded Natural ROS class is characterized by an environment that ranges from natural appearing to substantially modified. This is a roaded area where roads and areas are both open and closed to recreation use.
>
> > *Roaded Modified (RM)*: An` ROS sub-class of the Roaded Natural class that is located along less used forest roads where the user will likely encounter large clear cuts and areas where management activities may be present. Chances to get away from other recreation users are increased, but logging activities will be present. A few low standard recreation facilities may be provided.

Analysis Methods, Analysis Issues

The Recreation Opportunity Spectrum was reviewed to determine the classification of the analysis area. The ROS setting indicators are access, remoteness, size, visual characteristics, site management, visitor management, social encounters and visitor impacts (Project Planning ROS Users Guide Chapter 60, USFS, 1987). Because proposed activities would not change any of current ROS setting indicators, this tool was not used for effects analysis.

An overview of recreational use was developed through first-hand knowledge from recreation personnel with over 20 years of experience managing the Emerald Creek Garnet Area, on-site visits by the interdisciplinary team (IDT), informal consultations with local residents, input from garnet area visitors, and from assumptions made from physical evidence. This recreation analysis is subjective and evaluates the recreational experience, proposed public access, economics and unauthorized prospecting. The analysis period for the project is 10 years.

Methodologies in this analysis correspond to the scope of proposed activities, the risk to the resources, available information (PF: R-1-6), the ability to differentiate effects between alternatives, and the information necessary for an informed decision. The analysis is done at the geographic scale appropriate for recreation resources, proposed activities, and potential for effects.

Existing Condition

Emerald Creek Garnet Area

Introduction

The Emerald Creek Garnet Area is within four air miles of State Highway 3 and approximately 35 miles from St. Maries, Idaho. The landscape is rural with both forest and farmlands. The adjacent land ownerships include private, state and national forests.

The Emerald Creek Garnet Area continues to be known internationally for its rare star garnets, which are more valuable than star sapphires and star rubies. This is the only site in the United States, and is one of only two places in the world (Idaho and India) where star garnets, are found. The garnet found at the site ranges in size from tiny sand crystals to dodecahedrons (12-sided crystals), the size of golf balls and larger. The Forest Service operates the fee site which is open seasonally to the public between Memorial Day weekend and Labor Day weekend, five days/week for recreational collecting of the gem-quality garnets, which includes both faceting material and star garnets. No private collection sites are available in this area. The Garnet Area is not just a local attraction. Each year visitors travel from every state in the United States and from many countries around the world to enjoy the experience of garnet digging (PF: R-18).

The facilities at the parking area include a toilet, bulletin board, a picnic table and signing. The facilities at the site include an A-frame administration building which houses displays of garnets and other gems and minerals, two picnic tables and a toilet. Forest Service staff is on site to sell permits, provide information about garnet collecting, monitor operations for compliance with rules and safety standards, conduct field trips for groups, and to ensure ongoing stream stabilization and maintenance of sediment ponds.

In 2005 2,695 people visited the site and purchased 2,205 permits (PF: R-11-15). Visitors to the site vary in age from young children in strollers to senior citizens. The collectors include a wide range of people: casual visitors interested in finding out what a garnet looks like, the hobby rockhounds who plan their vacations traveling across the country from one gem or mineral site to another, families planning a day outing, rockhounds who cut garnets and other stones for sale, and those visiting the site with a guide working under a special use permit issued by the Forest Service.

Groups touring the area have included school groups of varying ages, from home school and elementary schools to college field trips for geology and other science courses. YMCA groups, Boy and Girl Scouts, church groups, senior citizen field trips, and students from foreign countries such as Japan have all toured the Garnet Area.

History

The Emerald Creek Area has long been known as a unique gem collecting area in Northern Idaho. Rockhounds have sought the garnets in the East Fork of Emerald Creek for decades. In the past, some of the lands within Emerald Creek with known garnet gemstones were in private ownership and managing gemstone collecting upon this land was problematic. In the 1960s and early 1970s there were a number of land exchanges for the purpose of consolidating National Forest lands in this area (see Chapter 1). The Emerald Creek Garnet Area Land Use Plan, St. Joe National Forest, also known as Appendix AA (PF: R-17) to the Forest Plan, describes past use:

> “Garnet digging has taken place through the area for many years. Until the spring of 1969, garnet digging throughout the drainage was unrestricted. Digging for the Idaho star garnet outside of the lease areas was restricted for the first time in the spring of 1969.
>
> Before the start of the 1969 field season, an intensive I&E [Interpretation and Education] program was launched. Meetings were held with rockhound organizations; news releases were sent to magazines and newspapers; and letters were sent to many rockhound organizations and individuals inquiring about the area. The public was notified that garnet collection was restricted to the existing lease area. Previously unrestricted digging had ripped open drainages without any semblance of control. This caused resource damage as well as creating hazards. Public safety became an important consideration. Rockhounds throughout the area were

> contacted and informed of the digging restrictions. As was expected, many people were unhappy about being restricted to the existing lease area. A large number of people voiced their dissatisfaction to the Forest Service and their congressional representatives.
>
> In 1969 a request for an additional concession area to be leased was made by the Forest Service. Advertisement of the new lease was made ready by the BLM but canceled because of public and congressional requests. Requests were made by letter and petition requesting the Forest Service be authorized to individually issue permits rather than having another concession in the area.
>
> Proposed agency regulation changes will have the Forest Service administer the area issuing permits for the BLM, thereby achieving the desires of the rockhounds."

The same document also describes long-range basic assumptions, some of which are listed as follows:

- Rockhounding will continue to grow as a family type outdoor recreation.
- Recreation type rockhounding is a valid use of the National Forest and should not be discouraged.
- The needs of the recreation type rock hound can be met by Forest Service administration of the garnet area.
- The highest and best use for the relatively small area used to dig garnets is for recreation type rockhounding.

The public, gem and mineral clubs, the Northwest Federation of Mineralogical Societies, the Forest Service, the Bureau of Land Management and Senator James McClure corresponded extensively about the garnet resources in the East Fork of Emerald Creek. Several public meetings were held, one that was attended by 120 participants, to discuss leases, land acquisition and the laws pertaining to the garnet resources. In July 1969, Senator McClure drafted HR 13141, a bill to establish the Idaho Star Garnet National Recreation Area (PF: PD-1). This bill was not passed into law.

A St. Maries Gazette Record newspaper article dated 08/16/73 notes that Ralph Kizer, Forest Supervisor "announced that through the efforts of the Idaho Congressional Delegation, the Department of Interior's mineral regulations have been expanded to authorize the U.S. Forest Service to issue permits for garnet digging in the Emerald Creek Garnet Area after August 13, 1973."

The Emerald Creek Garnet Area opened in May of 1974 in No Name Gulch, operated by the Forest Service. Progressive hand digging proceeded in No Name Gulch and Pee Wee Gulch until 1985, when operations were moved to the current location in 281 Gulch where garnet removal has occurred to the present time. In its first full season of operation at Pee Wee Gulch in 1975, 1,502 permits were sold. The average number of permits sold per year between 2000 and 2005 was 2,103. Over the past 31 years of operation, visitors have removed an average of one pound of garnet per permit sold. The Garnet Area receives an estimated average of 3,600 visitors annually, with at least one half of those visitors purchasing permits to dig for garnets (PF: R-33).

Recreational Experience of Past (1974-2005) Garnet Area Visitors

From State Highway 3, visitors drive six miles on gravel Road 447 to the parking lot located on the East Fork of Emerald Creek. A 3-panel interpretive sign provides information about garnet digging, the railroading history of the area, and includes a map of the garnet area. The diggers carry their tools: a shovel, bucket, rubber boots and a 12-18" square screen box, as well as their lunch and beverage, or tools may be rented at the A-frame administration building. A 2,075 feet (0.4) mile gradual uphill hike on a gated road leads them to the A-frame administrative building in a small meadow on 281 Gulch. As they approach the A-frame, people often observe small fish, frogs and toads in the sediment-settling pond.

At the A-frame Forest Service employees greet visitors, showing them a display of garnets, garnet jewelry, and other gems and minerals from all over the United States and a series of photos describing the garnet digging process. They explain the process and the permits required for anyone digging, washing or

screening for garnets. Visitors just curious to see the collecting operations are encouraged to hike to the sites and take a look around at no charge.

Rockhounds purchase a permit that costs $10.00 for adults, $5.00 for children age 14 and under. Shovels, buckets, and screen boxes are available for rent for $1.00 each per day, or visitors can bring their own tools. Rock hounds hike ¼ to ½ mile further to one of two designated collection sites on the East and West Forks of 281 Gulch. Garnet digging is wet, muddy work. The digging areas are in the streambed and in the adjacent banks. The garnets are found in the mica schist gravels just above bedrock. The depth varies from two to eight feet deep, depending on the overburden. A visitor may start a new hole within the designated area, or may work in a hole previously started. The bucket comes into play here, to bail the water out of the hole, and then digging commences. Forest Service employees demonstrate techniques, and rock hounds dig through a layer of topsoil, a layer of clay, then down to the mica schist gravel layer, just above bedrock, where garnets are found. Material from this layer is shoveled into a screen and carried to a settling pond where it is washed by shaking the screen back and forth, sifting out the dirt and clay and cleaning the gravels so the garnets can be seen. Visitors then sort through the gravels and search out the garnets. This process is repeated as long as the diggers' backs hold up! Most of the better quality garnets are found at or near bedrock, so sometimes quite a bit of digging has to be done before garnet-bearing material can be reached.

Some rockhounds collect the tiny sand crystals. Most are seeking gem quality garnets ¼ inch or larger, in order to have garnets for jewelry. Garnets are found in veins or in pockets, so visitors may have to move considerable material to find the garnet. The daily permit allows up to five pounds of garnet. The average over the past 27 years is just over one pound per person. If they wish to remove more garnet during the same day, they can buy another permit for each additional five pounds or fraction thereof that is removed. Collectors are limited to six permits or 30 pounds of garnet per year. When finished, the rock hounds hike back to the A-frame building, where their garnet finds are weighed and recorded, then they walk back down to the parking area.

Many of the garnets dug will remain with individual families as part of their rock collection. They may have a few stones cut for jewelry and display, particularly if they have found star material. Garnet sands are used in fish bowls, flowerpots and for other decorative purposes. Many of the garnets will find their way to private or commercial lapidary outlets where individuals work the raw stones into finished jewels for sale.

Economic Benefits

Economic benefits are associated with the recreational garnet collecting. Tourism connected with the it provides income to many local businesses. Grocery, hardware and clothing stores, restaurants, cafes, laundromats, and service stations in Fernwood, Clarkia, Emida, St. Maries and surrounding areas benefit from the business generated by rockhounds visiting the Garnet Area. Research done in conjunction with the National Forest Visitor Use Monitoring studies in the years 2000 – 2003 (Stynes & White, 2005; PF: R-25,26) have produced figures that estimate spending profiles for national forest visitors. Using the average number of people per party surveyed for the Idaho Panhandle National Forests, local businesses could expect to see from $121,381 to $207,018 annually.

Garnet removal and cutting the rare star garnets provides a unique opportunity in the area. Individuals who work the raw material into finished jewels, display garnets, or sell them through commercial means derive financial benefits. Many of the garnets will find their way to commercial outlets and are of direct benefit to lapidary and other commercial business. Garnets are for sale via internet web sites as well. There are offerings of rough garnets on up to finished cabochon cuts. One web site offers "star garnet rough" material for sale at $20.00 per pound. They list finished 6-ray star garnets for sale at prices ranging from $45.00 for a 3.5ct (carat) stone to $395.00 for an 11.3ct stone. Other sources sell mine run (rough) garnet for $300.00 per pound. Good quality, sorted material can run $70.00 per ounce or $1,120 per pound according to local rockhounds. (PF: R-23)

Social Benefits

The garnet area provides a unique recreational opportunity for families and friends to spend quality recreational time together. Many of the families that collect here include several generations, from young

toddlers to grandparents. It is not possible to put a value on the exceptional experience that visitors have at the Emerald Creek Garnet Area. The smiles on the faces of small children who find a chip of garnet, or the thrill of a serious rockhound who discovers a specimen quality garnet crystal cannot be measured. Comments recorded in the Clarkia Bunkhouse guest register include:

> "We had so much fun digging garnets."
>
> "We found 11 oz. of garnets in 5 hours including one perfect dodecahedron."
>
> "Love it here. Best kept secret around. We took home 11 lbs. of garnets. What a fun time! We hope to return."
>
> "Three days of garnet digging. We had a great time. Keep this gem open for more fun times."

Publicity

Because the star garnet is found only in Idaho and India, the Emerald Creek Garnet Area has received considerable publicity from the media, including segments on regional television programs, numerous newspaper articles each year, and various magazine articles including *Lapidary Journal*, *Sunset Magazine*, *Travelin' Magazine*, *Rocks Digest*, and National Geographic's *America's Outdoor Wonders: State Parks and Sanctuaries*, and *Horizon Air Magazine* to name a few. A number of private individuals have created web pages on the internet to provide information about garnets and to offer cut and polished garnets for sale. Many of the web sites refer to the Emerald Creek Garnet Area and offer information. The IPNF also provides a web site with information about the garnet area. (PF: R-19-22, 29-31)

Operations

For 31 years the Garnet Area has opened and operated from Memorial Day weekend through Labor Day weekend.

Each fork of 281 Gulch is being dug progressively, from the upper reaches of the garnet deposits downstream, and is rehabilitated yearly following digging. An estimated 200 – 300 feet is dug in each gulch annually. Distances vary depending on the number of rock hounds digging and the extent of their digging.

Site preparation occurs the week prior to the opening to the public. For the past several years, the West Fork of 281 Gulch, which is non-fish bearing, has opened for digging on Memorial Day Weekend. In preparation, brush is cut, trees and windfalls within the dig site are felled, removed and stockpiled, and employees install straw bale sediment dams in the seasonal stream. Cloth sandbags filled with native material are also used. Sediment ponds and washing ponds are in generally in place from the previous years' rehabilitation work.

Channel alterations (e.g. excavation, water diversion, garnet digging,) do not occur in fish-bearing reaches of the East Fork of 281 Gulch until after fish spawning is complete. Beginning on July 1, site preparation begins, and the area is opened for the 4th of July holiday. Prior to opening, the stream is routed through a metal irrigation pipe in order to bypass the digging area. Straw bale sediment dams and cloth sandbag dams are installed. A larger settling pond with a fish ladder near the A-frame building has a small wooden dam with an opening that can be adjusted for height. In the spring the dam is closed to retain the water and allow suspended sediments to settle before the stream flows over the dam.

Rehabilitation has occurred at the end of each season. Depending on the location, it is accomplished either by handwork or with equipment such as a backhoe. Dug out holes are filled in and the stream is returned to its streambed. Large and small woody debris is incorporated into the rehabilitation. Upon recommendation of the fisheries biologist or the hydrologist, in-stream structures such as log step-downs may be installed and small pools are created. Trees and shrubs are planted on areas that were rehabilitated in the previous year.

All rehabilitated areas are seeded, fertilized and mulched.

Because of deeper overburden (10-14 feet) in the West Fork of 281, mechanical removal of overburden has been employed for the last several years to facilitate hand digging by the rock hounds. Excavated materials

were stockpiled for use in rehabilitation on completion of the digging. This work is generally done in the fall when stream flows are low and rubber tired or track equipment can work effectively in the drainages. Any areas exposed are covered by erosion cloth or are seeded and mulched with straw.

Past Emerald Creek Garnet Area operations were located in Pee Wee Gulch and No Name Gulch from 1974 through 1984. Since 1985, the operation has been located in 281 Gulch. Refer to the Recreation Emerald Creek Garnet Area files, for monthly and annual recreation reports.

There has been sporadic unauthorized digging for garnets in various locations within the project area. Employees, volunteer hosts, and law enforcement officers patrol the area to discourage this activity.

Refer to the Minerals section for additional information about the garnet resource.

Available Camping at Nearby Developed Campgrounds

Emerald Creek Campground is located near the junction of Emerald Creek Road 447 and Clarkia-Emerald Road 504. It is located within two miles of the Emerald Creek Garnet Area. Most of the campers using the site are visitors to the Emerald Creek Garnet Area. The campground was renovated in 1998 – 1999 and is operated as a fee site. The campground includes 18 camp units, water from a hand pump, and three universally accessible vault toilets. The renovated campground includes resurfaced roads and pathways, three concrete accessible toilet buildings, new tables, fire rings and upright grills, signing, a bulletin board and fee station, and expanded parking spurs, family units and tent pads. The campground receives moderate use during the spring, summer and fall, with peaks on holidays and on weekends. The current managed season is from Memorial Day weekend through Labor Day Weekend.

Cedar Creek Campground is located near the project area. Visitors to the Emerald Creek Garnet Area frequently use it. The campground has three overnight campsites and three picnic units. It is located on State Highway 3 along the St. Maries River, approximately 10 miles from the Garnet Area. It was renovated in 1999 – 2000, and has been operated as a fee site since 2001. The campground now includes a universally accessible vault toilet building, resurfaced roads and pathways, new tables, fire rings, signing, a bulletin board and fee station, and three day-use picnic sites with tables and fire rings. The campground has no potable water. The site receives moderate use in the spring, summer and fall, filling to capacity on holiday weekends. The current managed season is from May 25 to October 31. (PF: R-32)

Camping at Undeveloped Sites

Within and adjacent to the project area, there are several undeveloped or dispersed campsites along roads that receive moderate to high use during the spring, summer and fall. Along the entire Emerald Creek Road 447, there are 13 regularly used dispersed campsites. Most of this use is associated with the Emerald Creek Garnet Area. The site of the old Emerald Creek Garnet Area parking lot at Pee Wee Gulch is frequently used as a dispersed camping site for RVs, pickup campers, trailers and tents.

Two dispersed sites are within the project area boundaries: one on East Fork Emerald Road 447 at the mouth of No Name Gulch and one at the mouth of Pee Wee Gulch (the existing parking area). Numerous other dispersed campsites described above are distributed throughout areas adjacent to the project area and are used by rockhounds and recreationists: two sites on Clarkia-Emerald Road 504, one site on the portion of the 504 Road north of Road 447, and one along the Emerald Creek Cutoff Road 1487, two on Bechtel Butte Road 3478. Use is low to moderate during week days, higher on weekends. The number of dispersed sites has remained fairly static over the past five years. The primary camping use of these sites is in the summer and fall. (PF: R-32)

The Fossil Bowl, a privately owned motorcycle race track and fossil-digging site has six camping sites with two portable toilets available. The sites include graveled parking spots. No other facilities are provided at the Fossil Bowl (PF: R-35).

Visitor Information Services/Bunkhouse Rental

The nearby Forest Service Clarkia Work Center on State Highway 3 provides visitor information services to the public, serving over 1,000 people annually. Many visitors stop here to obtain information about the Garnet Area. In 2004, the Clarkia Bunkhouse cabin rental program accommodated 290 people over 124 nights. Based on the guest register, about 70% of the renters are garnet collectors.

Recreation Special Uses

A special use permittee guides individuals to the Emerald Creek Garnet Area to collect for garnets. The permittee has operated at the Garnet Area since 1979. Over the past 13 years the permittee has guided an average of 83 collectors per season to the site.

There is currently one permittee who holds a permit for guiding deer hunting in the project area. There are presently no designated or reserved outfitter camps within the project area boundaries.

Day Use/Gathering Forest Products

Day use in the Emerald Creek area includes collecting garnets at the Emerald Creek Garnet Area, driving for pleasure and sightseeing, fishing, gathering forest products (huckleberries, mushroom, Christmas trees), firewood collecting, hunting for birds and big game including spring black bear and cougar, and late summer through fall elk, deer and black bear season.

The access roads, Road 447 (Emerald Creek Road), Road 504 (Clarkia-Emerald), and 3478 (Bechtel Butte), are used by visitors and residents.

Fishing

Area residents and other visitors fish the St. Maries River and its tributaries. Use is light.

Fossil Digging

Digging for fossils occurs at the privately-owned Fossil Bowl. The owner estimates the yearly average to be 2,400 people who participate in fossil digging, including school groups and individuals.

Motorized Use for Vehicles Under 50 Inches Wide

Adjacent to the project area, there is very light motorcycle and snowmobile use. The majority of ATV (all-terrain vehicle) use is incidental to summer recreational and fall hunting season and occurs along the open roads with mixed vehicle traffic and on roads managed in one of two ways. Roads that are generally needed for administrative or fire protection purposes have restricted use, usually by a gate, for resource concerns and/or facility protection. The management strategy is to discourage or eliminate motorized public use of the road. The second type of road management is similar, but the use and need for the facility is anticipated to occur at a lower frequency. The road may remain “closed” for a period of 5 to 15 years between uses. Use by vehicles that are under 50 inches wide may be accepted, discouraged, eliminated or prohibited. ATV use associated with hunting and pleasure riding ranges from moderate during the spring and summer to high on holidays and during fall hunting season.

The privately-owned Fossil Bowl offers a developed motorcycle racetrack, with a yearly average of 5,000 persons participating in motorcycle racing.

Trails

There are currently no developed trail systems within the project area. The access road to the Emerald Creek Garnet Area is along the route of the abandoned Trail 281. There are no groomed snowmobile or cross-country ski trails within the area. In general, the area receives very light winter use by snowmobiles and cross-country skiers on existing roads.

Environmental Consequences

FOR ALL ALTERNATIVES

The floodplain at Pee Wee parking lot would be partially re-established leaving room for a vehicle turnout or pull-through only. The current dispersed camping site at this site would no longer be available.

RECREATIONAL EXPERIENCE

As noted in Chapter 1, new methods for garnet discovery and collection are proposed in order to protect water quality, aquatic habitat, provide the public as safe an environment as possible and to fully recover the garnet resource.

The actual garnet collecting experience for visitors would be very different from the past. Earlier descriptions under existing condition present the past garnet collecting experience for Emerald Creek Garnet Area visitors. Please see the section under Alternatives Considered but Not Given Detailed Study in Chapter 2 for additional detail regarding the changes in recreational experience.

The new experience would require a different kind of physical activity**.** Visitors would no longer be digging to find garnets; they would use a bucket to collect garnet-bearing gravels from a stockpile and then take it to a sluice for washing and discovery. Instead of negotiating rough terrain and then digging and washing the gravels, visitors would be hauling buckets to a sluice and bending and stooping at a sluice to wash the gravels.

Depending on the day, there could be delays at the sluice while waiting for a slot or periodic shutdowns for pump and system maintenance. There would also be unavoidable noise from the pumps and running water to operate the sluice. By contrast, the past experience was rather quiet with sounds of shovels, hand digging and people's talk.

The experience using new methods would likely be a bit more social, because of the gathering of everyone to the sluice. There would still be the thrill of discovery but it would take less effort to accomplish. For veteran collectors who may have more knowledge and ambition regarding how to find the garnets in their natural state**,** they would likely feel that they have lost this advantage. Dipping from a pile of gravel diminishes some of that experience. Here are some examples of comments the Forest Service has received:

> "Thrill of digging… makes it an authentic experience"
>
> "All of the appeal of fishing in a wading pond"
>
> "Would greatly reduce the sense of joy and satisfaction of finding a gemstone… sifting through pre-dug material would be equivalent of going to Wal-Mart and digging in a pile of dirt"

However, those less physically able e.g. very young, elderly and disabled may be able to participate more fully. People would not have to negotiate rough terrain and dig holes. Here are some examples of comments the Forest Service has received:

> "Great example of common sense"
>
> "Would enjoy not having to remove the overburden"
>
> "Your plans are very good"

As noted in Chapter 1, one of the reasons for proposed changes in operations is to maintain as safe environment as possible for the public and Forest Service employees. Using the new methods, both the public and Forest Service employees would be in a less inherently risky environment. (PF: R-34)

Recovery of the garnet would also be thorough and complete with this method compared to past methods. New methods would provide more garnets for the future to make this recreational experience available for as long as possible. Please see the Chapter 1 and the minerals section in Chapter 3 for more detail.

ALTERNATIVE A

After an estimated two to four years, recreational garnet collecting for the Idaho star garnet would be closed. Signs, picnic tables and vehicle wheel stops in the parking area would be removed. The A-frame and toilet buildings would be removed. The road to the A-frame building (Road 3781) would be removed from the road system and would be recontoured. The Pee Wee and 281 Gulch parking lots would be rehabilitated leaving room for turnouts only. Until site closure, the recreational gemstone discovery and collecting would continue in 281 Gulch down to Road 447.

Direct and Indirect Effects of Alternative A

Site Closure

In two to four years the site would be closed. The social benefits to individuals of all ages enjoying this unique recreational experience would be lost. There are no other known areas where gem collectors can prospect and collect star garnets without acquiring a commercial lease. The Forest Service would publish news releases and note on their web page that the recreational gem collecting area was closed. In spite of these efforts, people traveling from all over the world would arrive at the recreational area only to find it closed. School groups would be unable to schedule their end of the school year field trips to the Garnet Area. It is likely that school groups, rock clubs and members of the public would be unhappy or angry at the loss of the sole opportunity to dig for star garnets. Recreational activity associated with garnet discovery would decrease.

Economic Benefits

After two to four years, the Emerald Creek Garnet Area would be closed. Potential economic benefits from the estimated 3600 people per year who visit the Emerald Creek Garnet Area would be lost. Stores, cafes, gas stations, laundromats and motels in Fernwood, Clarkia, Emida, St. Maries and surrounding areas would experience a decrease in tourism revenue (potentially from $121,381 to $207,018 annually) currently brought in by the rockhounds; please see the economics section under Existing Condition. A more limited supply of star garnet material (through commercial leases) would only be available for those individuals who work the raw material into finished jewels, display garnets, or sell them.

There would likely be indirect effects to nearby recreation sites. As noted above under Existing Conditions, many of the people visiting the Emerald Creek Campground, other nearby campgrounds, dispersed camping sites along Garnet Area access roads and the Clarkia Bunkhouse Cabin Rental are garnet collectors. It is very likely that these visitors would decrease and the receipts from the fee sites would decrease.

Unauthorized Prospecting

With closure of the Emerald Creek Garnet Area, unauthorized prospecting for garnets is expected to increase throughout the project area.

Problems experienced in the area prior to the 1974 opening of the Garnet Area could resurface. These problems were described in Emerald Creek Garnet Area, St. Joe National Forest, also known as Appendix AA to the Forest Plan:

“Prior to 1969 a large amount of time was spent by rockhounds digging in the side drainages of Emerald Creek. Unsafe and unsanitary conditions existed. Used toilet paper and related materials, lunch wrappers and discarded clothing could be found scattered around the digging sites. Trees were undermined by garnet seekers to possibly later topple in a windstorm. Unsafe trenches and tunnels were built to later collapse or present the unwary with a deep water hazard. At one time dynamite was used which placed others in the area in danger.”

Unregulated digging can bring about accidents. In 2003, the newspaper *Missoulian* reported that a man digging for crystals in another National Forest “died when the small tunnel he was digging collapsed”. (*Missoulian*, 9/2003)

Additional law enforcement efforts would be needed to patrol and enforce the closures. Employees patrolling the area would have to determine whether or not campers in the area were engaged in unauthorized prospecting for garnets. This pattern would continue for an unknown amount of time.

Public Access

Public access to the garnet collection site in 281 Gulch would remain the same as it is currently until the area is closed: From State Highway 3 visitors drive six miles on gravel Road 447 to the parking lot located on the East Fork of Emerald Creek. A 2,075 foot (0.4 mile) mile gradual uphill hike on a gated road leads them to the A-frame administrative building in a small meadow on 281 Gulch. The remaining garnet collecting area in 281 Gulch would require no additional walking past this point. Disabled individuals are allowed to make arrangements for driving up Road 3781 to the administrative A-frame building.

Cumulative Effects of Alternative A

After closure of the Emerald Creek Garnet Area, recreational activities are expected to decrease over time in the Emerald Creek area. Increased law enforcement patrols would be necessary to prevent unauthorized garnet prospecting within the Emerald Creek area.

Direct and Indirect Effects of Alternatives B & C

Alternatives B and C would keep the Emerald Creek Garnet Area open for public garnet discovery and collection. After the removal of garnet in 281 Gulch, the Emerald Creek Garnet Area would be moved to Garnet Gulch and garnet collecting would be available for an additional 10-20 years. Use associated with the Emerald Creek Garnet Area on nearby recreation sites would continue.

Continuing Garnet Operations

For both Alternatives B and C, the economic benefits to local communities through tourism revenue previously described under Existing Condition would continue. Since the garnet area would remain open, unauthorized prospecting would be minimal with the two action alternatives.

Recreational Experience

The recreational experience for Alternative C with the adjacent parking lot to the wash plant at the Garnet Gulch site would be in a less rustic and natural setting when compared to Alternative B. There would be the sights and sounds associated with a parking area such as vehicle noise and slamming doors.

The social benefits to individuals of all ages enjoying this unique recreational experience would continue. The Idaho state gemstone would continue to be discovered and collected. School groups, rock clubs and other rockhounds would continue to visit and enjoy the Emerald Creek Garnet Area.

Public Access

For both Alternatives B and C, public access to the garnet collection site in 281 Gulch would remain the same as it is currently. From State Highway 3, visitors drive six miles on gravel Road 447 to the parking lot located on the East Fork of Emerald Creek. A 2,075 foot (0.4 mile) gradual uphill hike on a gated road leads them to the A-frame administrative building in a small meadow on 281 Gulch. The remaining area in 281 Gulch would require no additional walking past this point. Disabled individuals are allowed to make arrangements for driving up Road 3781 to the administrative A-frame building.

Alternative B

When operations move to Garnet Gulch, a new road (0.68 mile) would be constructed up Garnet Gulch for administrative and disabled access only. All other visitors would be required to park at the existing 281 Gulch parking lot and hike the trail and road to the garnet collection site. At the end of the Garnet Gulch road, a small parking lot, toilet, administrative building and sluice would be constructed (approximately one acre of clearing) and picnic tables installed.

A trail from the 281 Gulch Parking Lot on Road 447 to the new road up Garnet Gulch would also be constructed (0.1 mile). This would allow visitors to go directly from the parking lot to the trail without having to walk along heavily traveled Road 447.

In summary, to get to Garnet Gulch the public would park at the existing 281 Gulch parking lot, take the new access trail from the parking lot to the new administrative road and then hike along this road to the collection site. The hike for the public would be steeper (pitches of 12 percent on the trail portion) and longer from what is now required to get to 281 Gulch. The hike to 281 Gulch is approximately 2,075 feet (0.4 mile) and the hike to the Garnet Gulch site would be 3,493 feet (0.66 mile). Some people may have difficulty with this hike. Benches for rest stops would be installed along the route. Interpretive signs relating to ancient Lake Clarkia and the geology of the area would be installed along the trail and road.

Alternative C

This alternative was developed in order to provide vehicle access directly to the Garnet Gulch site. Nearly everyone (not just disabled people and administrative traffic) would be able to drive the new road and park at the administrative site. Parking for approximately 26 vehicles would be available; this is considered adequate for current visitor estimates.

The road access would not accommodate buses and RVs so these people would still need to walk the 0.66 miles to the collection site. Also, in the event that the parking lot would fill at the Garnet Gulch collection site, the 281 Gulch parking lot could accommodate any overflow vehicles. These people would also need to walk the 0.66 miles to the Garnet Gulch site as described under Alternative B.

Cumulative Effects of Alternatives B and C

Recreational activities are expected to remain relatively constant, with gradual increases over time. Routine law enforcement patrols would occur to prevent unauthorized garnet prospecting within the project area.

Forest Plan Standards

After 281 Gulch is closed, Alternative A would not meet Forest Plan standards or direction for recreation. The standards for Management Area 4 state, ”The Emerald Creek Garnet area will be managed to provide a unique recreation rockhound experience in accord with its current management direction” (Forest Plan, III-2). A Forest Plan amendment may be required to implement Alternative A. Both Alternative B and C would be within Forest Plan Standards for recreation.

SCENIC QUALITY

Regulatory Framework

Numerous Federal laws require all Federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning and project design, implementation, and monitoring. Some of these laws pertinent to this project are: National Environmental Policy Act of 1969, National Forest Management Act of 1976 and Surface Mining Control and Reclamation Act of 1977.

Scenery management direction for the analysis area is contained in the Idaho Panhandle National Forest Land and Resource Management Plan of 1987 (Forest Plan) and is described in the terms of Visual Quality Objectives or VQOs (PF: SC-1). VQOs are based on the area seen from sensitive travel corridors and other features having a high visual sensitivity level. Visual Quality Objectives were also assessed using guidance contained in the Visual Management Handbook, Chapter I of the National Forest Landscape Management Series (USDA Forest Service publication 462, 1974; PF: SC-2). The system was revised and is now known as the Forest Service Scenery Management System. The revised guidelines are contained in Landscape Aesthetics, a Handbook for Scenery Management (USDA, Forest Service publication 701, 1995; PF: SC-3). Terminology from the Forest Plan (1987) is used in this assessment.

Forest Plan and Visual Quality Objectives

Visual quality objectives (VQOs) were established during the Forest Planning process using scenery data regarding landscape attractiveness and visibility analyses. For the Forest Plan computer mapping was used to establish the area seen from sensitive travel corridors and other features having a high visual sensitivity level. The computer mapping is then edited as needed during field inventories to produce adopted scenic quality objectives. Forest Plan standards require the evaluation of the scenic resource based on sensitivity levels and require projects to meet adopted visual quality objectives. Exceptions may occur in unusual situations identified through the planning process with the interdisciplinary team.

Geographic Scope

The geographic scope of this analysis is the project area as defined in Chapter 1. Cumulative effects analysis includes the Emerald Creek drainage.

Analysis Methods

The scenery inventory for this area was done in the Forest Plan and in previous projects within this project area, e.g. Emerald Resource Unit FEIS (1993). The current visual quality of the area was defined by assessing its landscape character and addressing whether the character would change with proposed management activity. This area was evaluated for its visual significance based upon viewing opportunities from the primary travel route in the project area. Proposed activities were then evaluated as to whether or not they meet adopted VQOs and Forest Plan standards.

To complete the scenery effects analysis, two primary references noted under Regulatory Framework were used, Landscape Aesthetics, A Handbook for Scenery Management, USDA Handbook No. 701 (PF: SC-3) and The Visual Management System, USDA Handbook No. 462 (PF: SC-2).

The following citations are taken from Handbook No. 701. These provide guidelines with which to analyze potential mining activities. Scenery analysis should consider “Visual sensitivity of the landscapes, based on the context of the landscape being viewed, perceptual factors of people viewing those landscapes and different visual characteristics of a landscape” (pg 19, 1995). “People have the ability to perceive landscape character and develop expected images” (pg 28). “Types of viewers are important…Types of viewers will vary by geographic region, as well as by travel route or use area such as a developed recreation site… Viewer expectations will vary according to the landscape setting and available recreation opportunities” (p. 33).

Existing Condition

Landscape character gives a geographic area its visual and cultural image, and consists of a combination of physical, biological, and cultural attributes that make each landscape identifiable, or unique. It includes a description of landform, water characteristics, vegetation patterns, and cultural elements appearing on the landscape.

The landscape character of the Emerald Creek drainage includes forested landscapes that have been heavily modified by timber harvest, mining and road construction activities. The area has been shaped by human activities and cultural influences. The land has been developed for timber production, agriculture, mining, grazing, and residential/urban uses. Numerous houses and farms are scattered along and up the side drainages. The community of Clarkia is within six air miles.

The landscape character of the project area is a forested landscape interrupted by roads, timber harvesting and openings along the riparian areas. Currently, in 281 Gulch there is a developed site for the recreational garnet area, the parking areas along Road 447 and the primary access road to the garnet area.

The combination of landforms, waterforms, vegetation, and cultural elements has resulted in a consistent landscape character over the geographic area. The landscape of the project area falls into *one landscape character class:*

Highly modified mature/immature mixed conifer forested landscapes on mountain slope or stream breakland landforms.

Variety Classes

Variety classifications are: Class A- Distinctive; Class B- Common, and Class C-Indistinctive. The project area falls into Class B – Common which is defined as: Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes have generally positive, yet common attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern and balance.

Landscape Visibility

Landscape visibility is defined by two elements: human values as they relate to the relative importance to the public of various themes and the relative sensitivity of scenes based on the position of the observer. The human value component is usually described by sensitivity levels. The relative sensitivity of the observer position component is described by utilizing varying distance zones.

Sensitivity Levels

Sensitivity levels 1-3 indicate the degree of scenery importance for specific viewing locations such as communities, recreation areas, roads, and trails. The main travel routes which traverse the larger area and corresponding sensitivity levels are the following (PF: SC-4):

- Sensitivity Level 1 (High): Emerald Creek Campground;
- Sensitivity Level 2 (Medium): Road 504 (Bechtel Creek to Bechtel Butte), Road 447 (Emerald Creek), and the Emerald Creek Garnet Area;
- Sensitivity Level 3 (Low): the remaining travel routes in the project area.

Garnet area operations in 281 Gulch cannot be viewed from Emerald Creek Campground, Road 447 or Road 504.

The Emerald Creek Garnet Area itself is considered a Sensitivity Level 2. This is a developed site with access road, administrative A-frame building, parking and associated equipment. Previous recreational digging in 281 Gulch progressed from the upper reaches down stream. Approximately 200-300 lineal feet along the stream were dug and rehabilitated each year. Thus, a visitor hiking upstream will see riparian areas in various stages of revegetation. For example, the most recent excavations for the garnet recovery site would have newly planted vegetation. The riparian areas (50-100 feet wide) upstream of the current excavated sites are in general devoid of large trees, but vegetation covers the ground.

There are no background views from the Garnet Area. The foreground and middleground views from the Emerald Creek Garnet Area are of a naturally forested landscape in the upland areas with the upstream riparian areas being in various stages of revegetation. For the most part, visitors stay in the immediate area of the current garnet collection site. In general, visitors are expecting to see mud, ponds and people collecting and washing gravels, i.e. a modified landscape in the immediate garnet collecting area.

Visual Quality Objectives

Visual Quality Objectives (VQOs) were adopted during the Forest Planning process using the scenery data obtained from the previously described landscape attractiveness and visibility analyses. Maps of adopted VQOs for the Idaho Panhandle National Forest (IPNF) generated during the Forest and project planning processes are available at the St. Joe Ranger District office in St. Maries.

Visual Quality Objectives consist of five levels that describe scenery management objectives ranging from very high scenic integrity to low scenic integrity. The five levels are: Preservation, Retention, Partial Retention, Modification and Maximum Modification. The levels are directly correlated to Forest Plan VQOs. Potential activity areas fall within VQOs of Partial Retention and Modification.

Partial Retention (Moderate Sensitivity): Management activities remain visually subordinate to the characteristic landscape. Activities may also introduce form, line, color or texture which are found infrequently or not at all in the characteristic landscape but they should remain subordinate to the visual strength of the characteristic landscape. The East Fork of Emerald Creek is the area of potential activity within this VQO.

Modification (Low Sensitivity): Activities may visually dominate the original characteristic landscape. However, these activities must borrow from naturally established form, line, color, or texture. The remaining activity areas are within this VQO.

Environmental Consequences

Land management activities can affect the scenic resource and landscape character because of contrasts created between natural or natural appearing forested landscapes and those landscapes that are unacceptably modified by management activities. These contrasts consist of changes in line, form, color and texture of the vegetation and soil. The effects of these alterations are somewhat dependent upon individual values. The Emerald Creek Garnet Area and main routes in the area are considered to be Sensitivity Level 2 which correlates to a VQO of “Partial Retention” in the foreground and “Modification” (Low) in the middleground and background. Map 2 in Appendix H illustrates the potential development areas in 281 Gulch and Garnet Gulch.

Direct & Indirect Effects Common to All Alternatives

Alternatives A, B and C would continue the recreational garnet discovery and collection site in 281 Gulch until the remaining resource is removed, approximately two to four years. The Emerald Creek Garnet Area in 281 Gulch cannot be viewed from the Emerald Creek Campground or the two main travel routes, Roads 447 and 504, identified in the Forest Plan. The garnet collection activity area in 281 Gulch is limited to a very small area (approximately two acres). Please see the Project Map (Map 2) in Appendix H. The current Emerald Creek Garnet Area includes an access road and an administrative and parking area with associated equipment. Area proposed for excavation is within the foreground of the Emerald Creek Garnet Area and has a VQO of Partial Retention.

Expectations of people using the area also determine the sensitivity level. “Viewer expectations will vary according to the landscape setting and available recreation opportunities” (p. 33 of USDA Handbook No. 701). People’s expectations become important to this analysis. The Emerald Creek Garnet Area promotes an experience that is within a modified landscape. The visitors are engaged in having fun while discovering garnet gemstones. In general, visitors are expecting to see mud, ponds and people collecting and washing gravels, i.e. a modified landscape in the immediate garnet collecting area.

Chapters 1, 2 and the Recreation section of this chapter there discuss how the recreational experience would change with new methods for garnet discovery. Before the summer season, equipment would be used to excavate and stockpile the garnet gravels. The excavated area is expected to be exposed from five to seven days, and none of this excavation would be occurring during the summer season. Therefore, visitors would not view excavations from any of the travel routes or the Emerald Creek Garnet Area itself.

Upon arriving at the Emerald Creek Garnet Area, visitors would see an administrative site with a parking area, administrative building, toilet, sluice, stockpiles of gravels or sediment, various ponds for holding water and/or sediment and a newly reclaimed area approximately ½ acre in size (approximately 0.1 acre per year) where the garnet gravels were removed. The newly reclaimed area would have topsoil, scattered slash and newly planted shrubs and trees. Rehabilitation of a stream in the West Fork of Emerald Creek was reviewed by the visuals specialist (summer 2000; PF: SC-6). This site has similar conditions to the East Fork of Emerald Creek. After mining the stream channel was re-established, large woody debris and stream structures were incorporated, and the area was revegetated within 2-4 years. From a scenic resource point of view, the results appear natural.

The area around the administrative site would remain a natural forest in the uplands. The recently excavated areas (approximately 0.1 acre per year) would have newly planted vegetation and be in various stages of

revegetation. There would be a lack of large trees within these areas that will take from 20-30 years to grow. Considering people's expectations and site reclamations, scenic integrity would be maintained

Direct and Indirect Effects of Alternatives B and C

For the scenic resource, these two alternatives are considered to have the same effects.

Alternatives B and C propose developing Garnet Gulch for the next garnet collection area after 281 Gulch is depleted. Activities in Garnet Gulch would last an estimated 10-20 years. The Emerald Creek Garnet Area in Garnet Gulch cannot be viewed from the Emerald Creek Campground or the two main travel routes, Roads 447 and 504, identified in the Forest Plan.

The garnet collection area along Garnet Gulch is approximately 4 acres. Please see the Project Map (Map 2) in Appendix H. Proposed activities would include a new trail, road and a 1-3 acre administrative site to be cleared at the Garnet Gulch site. Effects to the scenic resource in Garnet Gulch from excavations and sluice operations would be the same as stated above under Alternative A for 281 Gulch.

One difference between Alternatives B and C would be the amount of area cleared for the parking and administrative area. Alternative B would require one acre, and Alternative C would require three acres. This

difference would have no real effect or difference for the scenic resource. As in 281 Gulch, the Garnet Gulch garnet collection site would not be seen from the Emerald Creek Campground or the two main travel routes, Roads 447 and 504, identified in the Forest Plan.

The biggest effect for the scenic resource with Alternatives B and C would be the new road junction, cattle guard and gate off of Road 447. This area is within the foreground of a Sensitivity Level 2 route (within the Partial Retention VQO). As stated above, Partial Retention allows for management activities that remain

visually subordinate to the characteristic landscape. Because of steep topography, the road would climb rapidly and require a switchback that would be seen while traveling this road. Road construction can create long-lasting visual disturbance because of soil displacement and contrast with changes in line, form, color and texture of the vegetation and soil.

Design features (see Chapter 2) which include prompt revegetation of the fill slopes, using local rock for buttressing for the cut bank and a rustic gateway for the new road would mitigate this disturbance. Also, when garnet area operations move to Garnet Gulch, the access road to 281 Gulch (Road 3781) would be removed, recontoured and revegetated. There would be no net increase of road junctions along this route (Road 447) to the garnet area.

Cumulative Effects for All Alternative

There would continue to be effects to the scenic resource in adjacent lands to the project area from mining, timber harvesting, road construction and maintenance, prescribed burning, farming, grazing and residential activities. The proposed garnet collecting activities when added to other reasonably foreseeable activities would not have measurable cumulative effects.

Compliance with Forest Plan Standards

Alternative A is within Forest Plan Standards. With the design features presented in Chapter 2 and the removal of the previous access road, Forest Plan Standards would be maintained for Alternatives B and C.

SOILS

Regulatory Framework

The Idaho Panhandle National Forests' Forest Plan (IPNF, 1987)

Objectives and standards applicable to this project are as follows:

Objective

Management activities will not significantly impair long-term soil productivity or produce unacceptable levels of sedimentation resulting from soil erosion. This would be accomplished through the use of Best Management Practices (BMPs).

Standards

- Soil disturbing management practices will strive to maintain at least 80 percent of the activity area in a condition of acceptable productivity potential for trees and other managed vegetation. Unacceptable productivity potential exists when soil has been detrimentally compacted, displaced, puddled, or severely burned as determined in the project analysis.

  Region 1 manual direction (2554.03 – R1 Suppl. 2500-99-1; PF: SW-21) for Soil Detrimental Impacts recommends maintaining 85% of an activity area's soils at an acceptable productivity potential with respect to detrimental impacts. This recommendation is based on research indicating that a decline in productivity would have to be at least 15% to be detectable (Powers, 1990). The manual definition of activity area excludes system roads and also states, "The standards do not apply to intensively developed sites such as mines, developed recreation sites, administrative sites or rock quarries."
- Projects should strive to maintain sufficient large woody debris to maintain site productivity.

Analysis Area and Analysis Methods

The analysis area for the soil resource consists of the proposed areas of ground disturbance, past mining areas, parking lots on Road 447 at Pee Wee Gulch and 281 Gulch, and the 281 Gulch access road (Road 3781, Appendix H: Map 2). Alternative A includes 281 Gulch and the parking lots on Road 447. Alternatives B and C include 281 Gulch, Garnet Gulch, and the parking lot on Road 447 at Pee Wee Gulch. In Garnet Gulch, proposed activities would occur on 4.2 acres for excavation, one acre for operating, and about 2.5 acres associated with road access. In addition there may be a parking-administrative area of one to three acres. In 281 Gulch there would be two acres of excavation and one acre for operations. Past activity occurred on about 2.2 acres in 281 and an estimated ½ acre in Garnet Gulch. The assessment of environmental effects focuses on four factors for the soil resource: erosion, compaction, displacement and productivity. Measurement of effects to the soil resource consists of area of disturbance for each watershed.

Existing Condition

Soils in the Emerald Creek area are derived from: 1) volcanic ash influenced loess, overlying weakly weathered subsoil and substratum material of residual, mica schist geology; 2) volcanic ash influenced loess, overlying moderately weathered subsoil and substratum material of residual, metasedimentary belt geology; or 3) volcanic ash influenced loess, overlying moderate to highly weathered subsoil and substratum material of granitic geology.

The volcanic material originated from the eruption of several of the Cascade volcanoes with most of the ash tracing back to Mt. Mazama (Crater Lake) in Oregon about 7,600 years ago. The top part of the ash is usually enriched with organic matter that is incorporated into this part of the soil. The volcanic ash influenced silt loam textured loess overlies gravel or cobble material derived from the underlying bedrock or depositional material. Below the volcanic ash, the subsoils and substratum tend to be medium to coarse textured in the residual parent material. These often moderately to highly weathered soils generally have a small to

moderate component of rock fragments, although this can be quite variable. For a detailed discussion of subsurface geology and processes refer to the Geology and Minerals section.

The garnet mining activities would be mostly located on Landtype 717 (Table 18), an alluvial drainage bottom soil primarily composed of ash-capped material derived from mica schist. Landtypes 757 and 761 are soil units located on moderate to steep side-slopes consisting of ash-capped material derived from mica schist.

Table 18 – Landtypes for Proposed Activity Areas

Garnet Gulch	717	4 acres	Low	High	High	High	High
	757	3-5 acres	Low	High	Moderate	Moderate	High
	761	0.5 acre	Low	High	Moderate	Moderate	High
281 Gulch	717	2.7 acres	Low	High	High	High	High
	757	0.5 acre	Low	High	Moderate	Moderate	High
	761	0.1 acre	Low	High	Moderate	Moderate	High

Landtypes

Seven landtypes were identified in the Emerald Creek project area (PF: SW-72, SW-75) out of which three are in the proposed activity areas (Table 18). Detailed descriptions of each landtype are located in the project file. Hazard ratings were also compiled and are broken into subcategories of mass failure, productivity, surface erosion, subsurface erosion, and sediment delivery potential. Each is rated as low, moderate, or high for a particular land type (Table 18).

In the project area, four percent of soils have a low, 74 percent have a moderate, and 22 percent have a high mass failure potential (PF: SW-72). The majority of landtypes classified as high are associated with lower sideslopes and adjacent stream bottoms.

In the activity area, all but one landtype (717) exhibit moderate mass failure potential (Table 18). The 6.7 acres of potentially high mass failures are located in and around the alluvial stream bottoms of Garnet Gulch and 281 Gulch.

For the project area, road related slumping is the most common form of soil movement. Soils, especially when derived from highly weathered mica schist parent material, are very uncohesive and have led to numerous landslides in the surrounding vicinity.

Removal of forest canopy and cover from harvest activities or wildland fire may increase landslide occurrence (Megahan et al. 1978, Gray and Megahan 1981). This is primarily due to root decay, soil disturbance, increased snow accumulation and altered melting rates, and soil water increases from reduced interception and transpiration.

In the project area, 96 percent of soils were rated as exhibiting low surface erosion potential and four percent were rated as moderate (PF: SW-72). In the activity areas, 100 percent of the landtypes exhibit low surface erosion potential (Table 18).

Roads are currently the primary source of erosion and sediment production in the project area. The dominant processes in roaded portions are surface erosion from bare soil areas of roads, including the cutslope, fillslope, and travelway. Revegetation of cutslopes and fillslopes are often difficult because of lack of soil moisture, organic material, low productivity potential, and desiccation of seeds and seedlings, especially on south-facing slopes. On moist slopes, revegetation efforts are more successful since erosion of road cutslopes and fillslopes is generally lower.

Road erosion and sediment yield usually decline after construction (Jones 2000; Switalski et al. 2004) but can provide a chronic, long-term source of sediment to streams within the project area. Periodic large pulses of erosion may occur during intense water yield and overland flow events in interaction with road drainage systems.

In the project area, one percent of soils were rated as exhibiting moderate subsurface erosion potential and 99 percent were rated as high (PF: SW-72).

In the activity areas, 100 percent of the landtypes exhibit high subsurface erosion potential (Table 18).

Disturbed suboils and substratum material are particularly conducive to erosion when associated with road building (Megahan, 1972). At such times, lower soil horizons and often bedrock on moderate to steep slopes are incised. Consequently, a large portion of the subsurface flow that occurred in the slope before construction is intercepted by the cut slope of the road and transformed to surface flow. Slopes in the Emerald Creek area are susceptible because of highly weathered parent material, such as mica schist, that contains little inherent stability.

In the project area, 73 percent of the soils were rated as exhibiting moderate sediment delivery potential, and 27 percent were rated as high (PF: SW-72).

In the activity areas, all land types exhibit moderate sediment delivery potential with the exception of high ratings on 6.7 acres (MU717) present in and around alluvial stream bottoms in both Garnet and 281 Gulch. For a more detailed discussion on sediments and water quality, refer to the watershed section.

In the project area, one percent of soils were rated as having moderate to moderately high productivity potential, and 99 percent were rated as high (PF: SW-72).

In the activity units, 100 percent of soils were rated as having a high productivity potential (Table 18).

Soil productivity refers to the soils capacity for growing trees given the site's parent material, topography, climate, vegetation and management history (Powers, 1990). The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil. This organic-matter-rich layer contains most of the soil nitrogen, potassium, sulfur, and mycorrhizae, which must be present for a site to be productive. In the Emerald Creek project area, the organic-rich layer is moderately thick (generally several inches) and the mosaic of generally cool and moist habitats contain little regeneration limitations.

Past Soil Impacts

Past Activity

Uncontrolled digging occurred in the valley bottoms over the past decades. An individual at the 281 Garnet site stated that digging of a hole 25-feet deep in the riparian area about a mile up from the confluence of Garnet Gulch and the East Fork Emerald Creek occurred in the 1950s (pers. comm.). From personal observation in Garnet Gulch, it is estimated that the localized unregulated digging occurred on about ½ acre.

Within both watersheds, there has been past digging activity and exploration trenching on about 0.1% of Garnet Gulch and about 0.6% of 281 Gulch. In 281 Gulch, mixing of soil horizons occurred from past mining activities but is not continuous over the whole valley bottom or length. Approximately 1,500-2,000 feet of 281 Gulch valley bottom has had garnet digging operations with the area of past activity occurring on about 2.2 acres.

Past beaver activity in both Garnet Gulch and 281 Gulch also influenced soils in the valley bottom and collected and stored sediment. Refer to the mineral and geology section for additional information on historical resource exploration and development.

Erosion

Minimal amounts of erosion have occurred at the past digging sites with the majority of the processes taking place during operations. Settling basins and collection structures, such as straw bale dams, have been used to collect sediment. The use of erosion blankets in addition to mulching and seeding of disturbed sites at the end of the digging season has reduced erosion.

Compaction

Detrimental compaction is estimated at about 1.75 acres limited to Road 3781 and the A-frame administrative site in 281 Gulch. Additionally the parking lots along the East Fork Emerald Creek were constructed with fill-material and have compacted surfaces and may have compacted underlying soil totaling about two acres. Also an excavator walked from 281 Gulch to Garnet Gulch to conduct exploration, and there is approximately 0.3 acres (PF: SW-46) of possible compaction associated with this trail (the excavator walked on slash for some of the distance it traveled).

Productivity

Within the entire watershed, past digging activity occurred on about 0.1% of Garnet Gulch and about 0.6% of 281 Gulch. In 281 Gulch, productivity has been reduced on 1.5 acres by the access road (Road 3781) and 0.25 acre at the administrative site. Mixing of soil horizons has occurred from past mining activities but is not continuous over the whole valley bottom or length. Approximately 1,500-2,000 feet of 281 Gulch (both West and East Forks) valley bottom has had garnet digging operations with the area of past activity extending about 2.2 acres. Some productivity may have initially been lost on this small portion of the drainages; however, acceptable productivity potential has been returned through maintenance and rehabilitation. Based on personal examination of the treatments that occurred on the recreational extraction sites within 281 Gulch between 2000-2005, the rehabilitation efforts appear successful. Good vegetative cover and no significant erosion –such as rills, gullies or sheet erosion – were noted. Based on qualitative visual estimation, site recovery is about 95% of pre-activity levels in terms of erosion. See Figures 16 and 17.

Displacement

A large portion of the overburden was removed at the recreational site in the West Fork 281 Gulch in the fall of 2000. It is estimated that 500 cubic yards were relocated and stockpiled nearby. Overburden removal was deemed necessary because of safety issues for the recreational digging. An additional 900 cubic yards of overburden were removed in the fall of 2001 and stockpiled at parking areas along Road 447. In 2004-2005, 360 cubic yards were removed and stockpiled nearby. In the East Fork of 281 Gulch about 400-500 cubic yards of overburden material has been removed and stockpiled nearby. Some displacement also occurred during construction of the access road.

A rotational slump occurred in the West Fork Emerald Creek beginning in 2002 with evidence of cracking and minor movement. By 2003 the slumping created a scarp approximately 4-5 feet high (PF: SW-6). The slump was mostly stabilized in 2004 through removal of material at the upper surface of the slump-block. It is believed that the reason for the occurrence of this rotational slump is the removal of overburden from the adjacent area downslope for the recreational garnet digging operation, the presence of clay lenses and subsurface water seepage. The size of this slump is estimated at 100 ft. x 30 ft. x 30 ft. This destabilized slope is not expected to experience further mass movement because of the proposed replacement of overburden.

Turbidity

Turbidity monitoring indicates that minimal erosion and sediment transport from the mining operations occurred, even during the spring runoff season. In 2004 and 2005, turbidity monitoring was conducted twice daily in 281 Gulch above and below the garnet removal sites. Results show that the state standard for turbidity was met on all occasions except for one reading that was high. Recreational diggers in the East Fork 281 discarded wash-water directly into the stream channel, which caused this aberrant reading. The high turbidity was not a result of erosion. The Forest Service suspended operations in this tributary until the next day when sampling showed turbidity to be less than the State standards. Sampling was also conducted in March 2005, following heavy rain over a two-day period that showed a background turbidity of 4.7 NTUs and 7.1 NTUs below the mining disturbance site. This increase of 2.4 NTUs is twenty times less than the State standards' instantaneous exceedance value of 50 NTUs (PF: SW-61).

Environmental Consequences

Compaction, displacement, rutting, and severe burning from management activities can have direct effects on the soils physical, chemical and biological properties. The duration of impacts on the soil resource depend primarily on soil texture, parent material, aspect, slope, climate, and degree of disturbance. The analysis of direct and indirect effects is based on how the various components of the project (e.g., location, activity area, operations, road construction, and reasonable foreseeable actions) are expected to affect soils in the Emerald Creek area.

Indirect effects on soils may include the potential loss of site productivity due to removal of large woody debris and nutrients, loss of soil wood, removal of topsoil, and their resulting effects to vegetative and hydrologic processes. Erosion, mass wasting, soil biology, and effects of wildfire can also be of consequence.

Direct and Indirect Effects

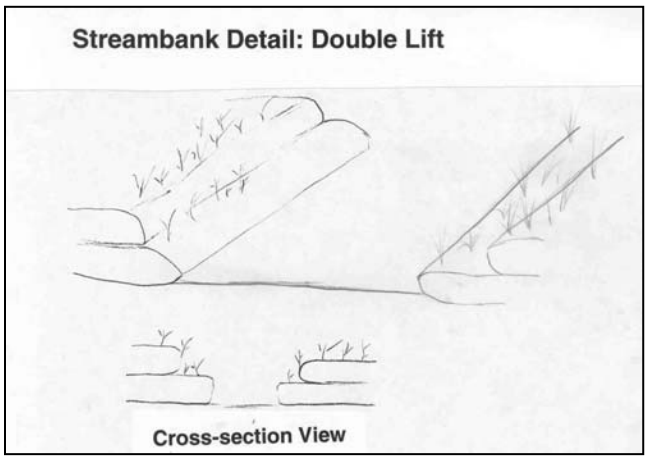
Alternative A

Proposed activities for this alternative would occur in 281 Gulch and the East Fork of Emerald Creek until the accessible garnet resource is depleted and the facility is closed and rehabilitated.

In the East Fork of Emerald Creek, floodplains would be partially re-established at the existing parking lot locations at Pee Wee Gulch and 281 Gulch.

Overburden and garnet gravel removal in 281 Gulch would cause soil/gravel displacement on approximately 2 acres over 2 to 4 years. Overburden materials from previous activities and sediment collected from the sluicing operation would be returned and re-used during reclamation. Temporary displacement from proposed gravel panels would occur for a timeframe of up to a week. The riparian areas would be rehabilitated guided by valley and stream channel cross-sections and stream longitudinal profile survey data collected in 2002-2006 (PF: SW-2, SW-4, SW-23, SW-24, SW-26, SW-27, SW-51), to configure and locate the reconstructed channel.

Streambanks would be stabilized using wraps of coir fabric or other biodegradable geo-textile to prevent or minimize erosion. One or two wraps of the fabric would be used depending on existing channel depth, each lift about 12 inches (See Figure 18). Fabric or geo-textile with a two to three inch layer of gravel may be positioned in the reconstructed stream bottom while logs may be placed to provide aquatic habitat and streambank and channel stability. Please see design features in Chapter 2 and Appendix A for more detail. The restored riparian areas (excavation sites) are expected to produce minimal erosion because BMPs and design features would be implemented. This includes covering disturbed sites using mulch, seed, slash, or erosion blanket while vegetation becomes established. Timber cleared for the proposed activities would also be used for large organic recruitment and in channel re-establishment as needed.



Soil productivity would be restored to near existing conditions because of substratum and topsoil segregation and replacement. Little compaction on the returned material would occur because equipment impacts would be minimal with track hoe travel-paths being decompacted as needed. Acceptable soil productivity would be returned as a result of recontouring and restoration on approximately 1.5 acres of Road 3781 and on approximately 1.5 acres of existing parking lots on Road 447.

The risk of mass failure would be minimal since slopes would not be overloaded. Temporary removal of soil during excavation on the gradual (<10-30%) toe- and sideslopes found in the proposed activity areas would be short term.

Alternative B and C

Alternatives B and C propose moving garnet operations to Garnet Gulch after closure of 281 Gulch. The floodplain at the parking lot on Road 447 at the mouth of 281 Gulch on the East Fork of Emerald Creek would not be reestablished because that parking lot would be needed to accommodate vehicles for the Garnet Gulch operation. Effects to soils from proposed activities would be the same as presented for Alternative A for both Garnet Gulch and 281 Gulch with the following differences.

Garnet Gulch operations would include building 0.68 miles of new road. Alternative B would include clearing a one-acre area for the administrative site, and Alternative C would include clearing a three-acre area for the administrative site. In Garnet Gulch, the new road construction, parking lot, operating area, and the administrative site for Alternative B would diminish soil productivity on 4.5 acres, and in Alternative C soil productivity would diminish on about 6.5 acres. Compaction in Garnet Gulch may occur over theses same areas also. The duration of operations is estimated at ~20 years or until the area is no longer used. This assumes that when operations are complete in Garnet Gulch the road, administrative site and operating area would be recontoured or rehabilitated through decompaction and, if needed, mulched and seeded.

Some erosion may occur on the newly constructed road and administrative area (PF: SW-43, SW-54, SW-55). This would be minimized using BMPs and design features (see Chapter 2).

Cumulative Effects

Alternative A

Activities would continue to occur on approximately 7.3 acres in the soils analysis area in 281 Gulch. Acceptable productivity potential would be maintained or improved because past and proposed disturbed areas (Road 3781, administrative site and mined areas) are or would be reclaimed or rehabilitated throughout the length of operation. Some soil erosion and sediment movement may occur as evident in the turbidity samples from 281 Gulch; however, Idaho State Water Quality Standards for turbidity are currently met in 281 Gulch. The turbidity increases, as sampled, are typically very small (PF: SW-61) and indicates minimal erosion and sediment transport from the mining operations.

There are no reasonably foreseeable activities in the soil activity areas.

Alternatives B and C

For 281 Gulch, these two alternatives have the same cumulative effects as Alternative A. Cumulatively, activities in Garnet Gulch have or would occur on approximately nine acres for Alternative B and 11 acres for Alternative C. This incorporates approximately ½ acre from past activities. Alternative C would have greater cumulative effects than Alternative B because of the increased area for parking (Table 19).

Some soil displacement may occur from proposed activities outlined in Chapter 2, p. 8-9. The turbidity increases, as sampled for 281 Gulch, are typically very small (PF: SW-61). The Forest Service expects similar results in Garnet Gulch due to implementation of similar erosion control practices as used in 281 Gulch and new operation methods. This would indicate minimal erosion and sediment transport from the mining operations.

Consistency with Forest Plan and Other Laws and Regulations

No consequential effect to soil productivity is expected because of the small extent of activity, new operational methods (segregated stockpiling of topsoil and substratum, replacement of substratum and topsoil in excavated sites), decompaction where needed, and road recontouring and mulching with organic material. Compaction and displacement are not expected to persist because the excavated material would be returned to the site, trails and operating areas would be decompacted, and activity roads would be recontoured. Minimal erosion is expected to occur because of implementation of BMPs and design features described in Chapter 2 and Appendix A.

The IPNF Forest Plan direction and Regional requirements for soils would be met due to new operational methods and implementation of design features (which include applicable BMPs) described in Chapter 2 and Appendix A. Long-term soil productivity is not expected to change and would be maintained through reclamation and rehabilitation of each site. Sufficient large woody debris would be utilized during reclamation and rehabilitation.

WATERSHED

Regulatory Framework

Forest Plan

The Idaho Panhandle National Forests' Forest Plan (IPNF, 1987) defines the following management goals for the water resources on National Forest System lands:

1. *Maintain high quality water to protect fisheries habitat, water-based recreation, public water supplies, and be within state water quality standards:* To help accomplish this objective, best management practices (BMPs) must be applied to management activities. Monitoring efforts must focus on the implementation of BMPs and their effectiveness in protecting water quality. Water quality that is below Forest standards must be improved through restoration projects and through scheduling of timber harvest and road building activities.
2. *Protect stream channel integrity:* Manage riparian areas to meet objectives for dependent resources (fish and wildlife habitat, water quality, stream channel integrity, and vegetation) while producing other resource outputs.

Forest-wide standards direct the following on NFS lands with respect to the water resource:

1. Management activities on Forest lands will not significantly impair the long-term productivity of the water resource and will ensure that state water quality standards are met or exceeded.
2. Maintain concentrations of total sediment or chemical constituents within State standards.
3. Implement project-level standards and guidelines for water quality contained in the Best Management Practices (Forest Service Handbook 2509.22, available upon request), including those defined by State regulation or agreement between the State and Forest Service such as:
    a. Idaho Forest Practices Rules
    b. Rules and Regulations and Minimum Standards for Stream Channel Alterations
    c. Best Management practices for Road Activities.
4. Cooperate with the states to determine necessary in-stream flows for various uses. In-stream flows should be maintained by acquiring water rights or reservations.
5. Manage public water system plans for multiple use by balancing present and future resources with public water supply needs. Project plans for activities in public water systems will be reviewed by the water users and the State. Streams not defined as public water systems, but used by individuals for such purposes will be managed to the standards stated below or to the fisheries standards whichever is applicable.
6. Activities within non-fishery drainages, including first and second order streams, will be planned and executed to maintain existing biota. Maintenance of existing biota will be defined as maintaining the physical integrity of these streams. Best Management Practices (Forest Service Handbook 2509.22), Appendix O, and riparian guidelines will be used to accomplish this objective.

7. It is the intent of the Forest Plan that models be used as a tool to approximate the effects of National Forest activities on water quality values. The models will be used in conjunction with field data, monitoring results, continuing research, and professional judgment, to further refine estimated effects and to make recommendations.

INFISH Forest Plan Amendment

Standards for managing riparian areas were established as Forest Plan amendments based on the Inland Native Fish Strategy (1995), commonly referred to as INFISH. Riparian Habitat Conservation Areas are determined for watersheds and essentially promote water quality benefits through stream shading, vegetative buffers for sediment control, and channel stabilizing features of woody debris and streambank vegetation.

Clean Water Act

A declared objective of the Clean Water Act (CWA) of 1977 (33 U.S.C. 1323) is to "...restore and maintain the chemical, physical, and biological integrity..." of streams (PF: SW-70). Primary authority for the implementation and enforcement of the Clean Water Act now rests with the U.S. Environmental Protection Agency (EPA). The Act authorizes state water quality standards. The CWA directs the Forest Service to meet state substantive and procedural requirements respecting control and abatement of pollution. The Forest Service is responsible for implementing nonpoint source pollution control and the Idaho Water Quality Standards (IDAPA 58.01.02) on National Forest System lands. Forest Service water quality policy is to: promote the improvement, protection, restoration and maintenance of water quality to support beneficial uses, promote and apply approved Best Management Practices (BMPs) to control non-point source pollution, comply with state and national water quality goals, and design monitoring programs for specific activities and practices that might affect in-stream beneficial uses.

State Water Quality Laws & Regulations

The State of Idaho established the Idaho Water Quality Law (§39-3601 et. seq.) and Water Quality Standards (IDAPA, 58.01.02) designed to protect beneficial uses. The State's Antidegradation Policy (IDAPA 58.01.02.051) directs that existing uses and the level of water quality necessary to protect those uses must be maintained and protected.

Designated beneficial uses for the St. Maries River below the confluence of the West and Middle Forks to Carpenter Creek are Cold Water Aquatic Life, Primary Contact Recreation, Domestic Water Supply and Special Resource Water designations and below Carpenter Creek Cold Water Aquatic Life and Primary Contact Recreation (IDAPA 58.01.02.110.11). Emerald Creek is an Undesignated Surface Waters (IDAPA 58.01.02.101.01); existing beneficial uses are aquatic life (cold water biota), and primary or secondary contact recreation (IDAPA 58.01.02.101.01.a).

Executive Order 11988

The Floodplain Management Order (PF: SW-57) directs that each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Analysis Area

The analysis area is the East Fork Emerald Creek (Appendix H: Map 3; PF: SW-34). The main stem Emerald Creek and the St. Maries River downstream of the proposed activities are discussed in terms of cumulative effects.

Analysis Methods

The assessment of environmental effects focuses on five parameters for the water resource: water quality/beneficial uses (including pollutants), water yield, stream channel integrity and wetlands. Site visits and data collection for effects analysis and condition assessment include (PF: SW-66):

281 Gulch

Sediment Sampling: 2001, 2002, 2003, 2004

Discharge Measurement: 2002, 2004, 2006

Restoration Participation: 2002, 2003, 2004 2005

Assessment Visits (~5 to10 annually): 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006

Turbidity Monitoring: 2004, 2005

Valley/Stream Survey Data: 2005, 2006

Garnet Gulch

Assessment Visits: 2003 (~2), 2004 (~6)

Sediment Sampling: 2006

Discharge Measurement: 2005, 2006

Valley/Stream Survey Data: 2005

Wetland Delineation: 2005

The sediment budget for the East Fork Emerald Creek applies sediment estimates to those areas within 200 feet of either side of a stream crossing to estimate surface fines, encroaching roads within 50-feet of a stream to estimate within channel erosion, new road construction, and the garnet mining operation (PF: SW-17, SW-18, SW-35, SW-43, SW-44, SW-54, SW-55, SW-74, SW-76). Crossings and encroaching roads (recontoured, stored, existing and new construction) were identified from GIS maps. Mining activity sediment generation was measured with an ISCO^{tm} automated sampler in 281 Gulch in 2002, 2003, and 2004 and was included in this analysis. Sediment from channel reconstruction was estimated from personal observation of fine-sediment winnowing on a rehabilitated reach of East Fork 281 Gulch (PF: SW-15, SW-17, SW-74).

A comparison of the GIS road coverage used by Idaho DEQ in their TMDL model and the current (updated) Forest Service road coverage shows that the DEQ did not model any roads that were previously recontoured or had stream crossings removed (storage) because these activities were not identified in the road coverage used by DEQ (PF: SW-35). The sediment estimate presented in this EIS includes all roads that were previously recontoured or stored. There were also existing stream crossings and encroaching roads in the Forest Service GIS road coverage that were not part of the road coverage used by DEQ; these were counted as additional sediment increases and added to the sediment budget.

Watershed Characterization

Emerald Creek has a maximum elevation of around 5,200 feet and is about 2,800 feet at its mouth. Emerald Creek flows east and north in a basin of about 37 square miles, whose confluence with the St. Maries River is about 7 miles north of Clarkia. This area receives about 40-44 inches of precipitation annually. Approximately 77% of the Emerald Creek basin is within the 3,000-4,500 foot elevational “rain-on-snow” zone (St. Joe GA, 1997.)

Valleys are broad in lower reaches of Emerald Creek and the St. Maries River. Upper reaches and tributaries generally have narrow valleys and moderately-steep to steep side slopes. Ridge tops are broad and rounded. Slopes are highly dissected and for the most part heavily vegetated with conifers, shrubs, forbs and grasses. Valley bottoms in lower reaches are meadows utilized for grazing, garnet sand mining, hay production and home sites.

Garnet Gulch and 281 Gulch are small tributaries of East Fork Emerald Creek. Garnet Gulch is about 327 acres and 281 Gulch is about 375 acres. The stream channels of these tributaries are classified as cascade

or step-pool (Montgomery and Buffington, 1997) and high to moderate gradient A or B channels and low gradient E channels (through beaver dam depositional areas) (Rosgen, 1996).

Precipitation

Annual precipitation is estimated at 40-42 inches for Emerald Creek. There is about a 40% runoff efficiency (Patten, pers. conv.) meaning about 17 inches of precipitation is evident as streamflow.

Discharge

Annual peak discharge at the Santa gauge site on the St. Maries River, from USGS records, ranges from 780 cfs to 12,300 cfs with a median value of 3,040 cfs (PF: SW-78). Discharges for the two-year peakflow (Q2pk or bankful) are estimated from Embry (1981) and Barenbrock (2002) (PF:SW-77).

Table 19 – Two-Year Peakflow Discharges

Emerald Creek	Embry	478 cfs
	Barenbrock	626 cfs
East Fork Emerald	Embry	247 cfs
	Barenbrock	324 cfs
281 Gulch	Embry	12 cfs
	Barenbrock	15 cfs
Garnet Gulch	Embry	10 cfs
	Barenbrock	13 cfs

Land Ownership

The USDA Forest Service has jurisdiction over approximately 12,646 acres or 53 percent of the land in Emerald Creek. There is about 25 acres of private land in the upper headwaters of 281 Gulch, and there is no private land in Garnet Gulch.

Activities

Past activities in Emerald Creek and the St. Maries River include timber harvest, road and railroad building, grazing, homesteads, mining and recreation. All of these activities have the potential to affect water quality through introduction of pollutants to the stream system. The Emerald Creek Garnet Company mined approximately 1,000 acres within the St. Maries River for garnet sand in the past 60 years (pers. comm. Steve Osburn, Emerald Creek Garnet Co.), including about five acres within the East Fork Emerald Creek. A total of 413 cow/calf pairs are allowed on the Emerald Creek allotment, of that 41 are permitted on National Forest lands.

Road Densities

Road densities are approximately five (4.96) miles per square mile in the East Fork of Emerald Creek (PF: SW-60).

Existing Condition

Water Quality

Beneficial Uses

The State of Idaho assigned Coldwater Aquatic Life, Salmonid Spawning and Primary Contact Recreation as beneficial uses within the St. Maries Basin; and Coldwater Aquatic Life, Salmonid Spawning and Secondary Contact Recreation for Emerald Creek (Idaho DEQ*,* 2003 p. 24). Undesignated streams (no assigned beneficial use) have the numeric criteria for cold water and primary or secondary recreation criteria applied to them (IDAPA 58.01.02.101.01).

Water Quality Limited Segments

Emerald Creek and the main stem St. Maries River below Clarkia are listed on Idaho's 2002 list of Water Quality Limited Water Bodies (303(d) list). These stream reaches are not supporting their beneficial uses or are below water quality standards. The pollutants of concern are temperature and sediment for the main stem St. Maries River from near Clarkia to Carpenter Creek and temperature further downstream. Sediment is a pollutant of concern in Emerald Creek from the confluence of the East and West Forks to its mouth, and temperature is a pollutant of concern throughout (PF: SW-14).

Total Maximum Daily Load (TMDL)

The State of Idaho conducted a subbasin assessment for the St. Maries Basin and its tributaries. This assessment was used to identify pollutant load allocations for sediment and temperature of streams within the St. Maries Basin listed on the State of Idaho's 1998 303(d) Report (Idaho DEQ*,* 2003 pp. 62-94).

Reduction of sediment levels and temperature inputs to streams may lead to full support of assigned beneficial uses. Sediment reductions, and temperature modifications through shading, are required within the St. Maries River (IDEQ, 2003, pp. xvi-xix), although there is currently no sediment reduction identified for Emerald Creek (IDEQ, 2003, p. 68). In Emerald Creek, the sub-basin assessment determined that shade canopy, over the main stream channels, needs to increase by up to 85% (ID DEQ, 2003, pp. 86 & 91) to meet the TMDL for temperature.

Turbidity Monitoring of Past Garnet Mining Activities

Turbidity monitoring indicates that minimal erosion and sediment transport from the mining operations occurred, even during the spring runoff season. In 2004 and 2005 turbidity monitoring was conducted twice daily in 281 Gulch above and below the dig (mining) sites (PF: SW-61). Results show that the state standard for turbidity was met on all occasions except one reading that was astronomically high. Recreational diggers in the East Fork 281 discarded wash-water directly into the stream channel, which caused this aberrant reading. The operation was shut down in this tributary until the next day when turbidity levels were below State standards. Also sampling was conducted in March 2005, following heavy rain over a two-day period that showed a background turbidity of 4.7 nephelometric turbidity units (NTUs) and 7.1 NTUs below the mining disturbance site (PF: SW-61). This increase of 2.4 NTUs is twenty times less than the State standards' instantaneous exceedance value of 50 NTUs.

Water Yield

Annual peak flows for the St. Maries Basin are typically associated with snowmelt, mid-winter rain-on-snow and rain-on-spring snowmelt (MacDonald and Hoffman, 1995, p.94). In 1996 a winter rainstorm (rain-on-snow) occurred, and streamflow at Santa (downstream approximately ten miles from Emerald Creek) was 12,300 cubic feet per second (cfs) which is the highest peakflow for 40 years of records. Large floods also occurred prior to this event and the expectation is that peakflows in the St. Maries River, though less in volume and perhaps occurring earlier, mirror those occurring in the St. Joe River. The largest documented flood since European settlers arrived in this area occurred in 1933 (as measured on the St. Joe River at Calder, Idaho) prior to establishment of the St. Maries River gauging station near Santa, Idaho. It is

expected that this flood event (1933) was also the largest for the St. Maries watershed, estimated at about 13,000 cfs (PF: SW-79).

The estimated bankful (2-year) flow for Emerald Creek is 626 cfs, and the estimated 100-year event is 2,461 cfs, based on Barenbrock's regression equations (Barenbrock, 2002; PF: SW-77).

Stream Channel Integrity

Stream channel conditions and effects are assessed for East Fork Emerald Creek and individual tributaries where activities are proposed. Cumulative stream channel effects downstream through Emerald Creek and the St. Maries River are discussed.

Stream channel integrity means that channel form (type) is representative of discharge and sediment yields. Fundamental to this discussion are channel types, response potential, and cause-effect evaluation. The channel types referred to here are from Montgomery and Buffington (1997) and Rosgen (1994). Sediment and water yield predictions are evaluated against channel response potential and cause-effect linkages to indicate a potential for compromising stream channel integrity.

Channel Types

Existing conditions are evaluated in terms of water and sediment yield characteristics and their relationship to current and potential natural channel form.

St. Maries River

In the lower reaches of St Maries River, channel types are predominately low gradient, Rosgen "F" and "C." These are alluvial pool-riffle channels under Montgomery and Buffington (1997) classification. Alluvium ranges from fine sands and silts to gravels and cobbles. This material is transported and resorted at high discharges, although flows at or near the average annual peak (QF2P at bankfull or less) do not appear to cause significant mobilization and redistribution. Upper reaches are predominantly Rosgen "B" or "E" channels, or cascade, step-pool or forced pool-riffle under Montgomery and Buffington's classification.

Cascade and step-pool reaches are considered transport segments that are morphologically resilient because they can rapidly convey increased sediment and discharge; pool-riffle reaches are response segments whose channels may incur significant morphological adjustment in response to increases in discharge or sediment (Montgomery & Buffington, 1997.) The lower reaches of the main stem of the St. Maries River are adjusting to riparian and watershed vegetative changes from harvest activities that may have limited amounts of large organic material that normally stabilize stream channels; and other activities like mining, grazing and fires that may have also reduced stabilizing streamside vegetation, especially the deep-rooted shrub component. Although lateral channel migration is occurring in some areas, this is expected in Rosgen "F" & "C" channel types. And comparison of aerial photography from 1933 and 2002 (PF: SW-48) indicates that there have not been major adjustments of the stream channel in that time frame in near downstream reaches of the St. Maries River from the mouth of Emerald Creek.

Emerald Creek

Emerald Creek has been modified from past mining activities, road construction and vegetation modification. Cedar trees and stumps of considerable size are evident along some portions of the East Fork Emerald Creek. The upper reaches of the East and West Forks Emerald Creeks are mostly confined and lower portions are unconfined within relatively wide alluvial valley bottoms. Stream substrate consists of silt, sand, gravels and cobbles.

The Emerald Creek channel below the confluence of the East and West Forks (non-FS land) has been extensively changed due to garnet sand mining. A large reach of this stream was rehabilitated in 2000-2001 following garnet sand extraction. From aerial photo interpretation (1996-2002, 2004) there appears to be some loss of sinuosity in this 1-1.5 mile reach (PF: SW-33).

East Fork Emerald Creek

The East Fork of Emerald Creek is predominantly a low gradient "C" channel or moderate gradient "B" channel, with areas of low gradient incised "F" channel (Rosgen, 1994). These are pool-riffle and plain bed sequences in the Montgomery and Buffington classification system (Montgomery and Buffington, 1997).

The East Fork Emerald Creek channel currently exhibits relatively low sinuosity (PF: SW-36) perhaps due to road location in the riparian area; vegetation manipulation; large-scale fires; past mining activities; stream channel rehabilitation through areas of mine tailings; railroad spur construction up the drainage bottom (currently evident as old pilings in the East Fork drainage bottom); or perhaps some combination of these activities.

Approximately one mile of the East Fork of Emerald Creek was rehabilitated in 1965 and 1991 following extensive mining in Sections 3, 9 and 10, T42N, R1E. These rehabilitation activities have not restored the channel to a "perfect" past condition but they did improve conditions over the mine tailings area (PF: SW-1, SW-36). In the Little East Fork Emerald, a tributary of the East Fork, and in the East Fork, beaver activity is creating a braided channel pattern in some areas (about 3/4 mile stream length over numerous reaches) and creating dams that are nominally acting like steps. Beaver activity like this is natural; and collected sediment along with a raised water table may promote vegetation and create wetland aquatic habitat.

Log weirs placed in the early 1990s have improved habitat conditions through creation of pools, cover and bank protection. Rock riprap is in place on at least two outside meander bends to protect road fill from the erosive force of annual high flows. This riprap prevents channel migration into the road prism.

Monitoring was conducted by the Forest Service to address habitat conditions as they relate to PACFISH and INFISH Riparian Management Objectives (RMOs). Henderson and others, (2002, PF: SW-86), collected data at various streams on the St. Joe Ranger District including the East Fork Emerald Creek. The East Fork Emerald met all RMOs except for width/depth ratio and pool frequency (which was 53/mi. compared to an RMO of 56/mi) (PF: SW-29). None of the sampled streams met width-depth (w/d) ratios, which may indicate that the INFISH w/d value is unattainable in today's climate and geographic scope. See the fisheries section for other habitat information.

Garnet Gulch

The Garnet Gulch channel consists of step-pool or cascade reaches (Montgomery and Buffington) above the proposed activity area. There are multiple distributary (overflow) channels, old beaver dams that collected sediment, and a shallow pond in the reach proposed for garnet extraction. This reach contains low-gradient Rosgen "E" or "D" channels. The shallow pond is mostly filled with sediment deposits. In some areas the stream flows underground for short distances (PF: SW-23, SW-24, SW-26). Below the activity area the channel is mostly cascade and step-pool (Rosgen high gradient "A" and "B" channels). Above and below the proposed activity area, valley walls mostly confine the valley bottom. Within the proposed activity area the stream is considered adjustable in its unconfined alluvial valley bottom (Montgomery and MacDonald, 2002).

281 Gulch

The East Fork 281 Gulch channel above the proposed activity area consists of step-pool or cascade systems (Montgomery and Buffington, 1997) and in some reaches an incised channel. The East Fork 281 Gulch valley bottom is both confined and moderately confined by the valley walls above the proposed activity area. The West Fork 281 above the project area is a steep intermittent drainage with steps and pools in place from past activities.

In the 281 Gulch reach encompassed by the proposed activities to its mouth the channel types are a Rosgen low gradient "E" channel and a higher gradient "B" channel (Rosgen), or plane-bed, and step-pool (Montgomery and Buffington, 1997). Within the proposed activity area the stream would be considered adjustable in its unconfined alluvial valley bottom (Montgomery and MacDonald, 2002.) There are multiple distributary channels, evidence of beaver activity and relatively flat depositional areas, in the reach proposed for garnet extraction (PF: SW-66).

Environmental Consequences

Effects Common to All Alternatives

Direct and Indirect Effects

Direct effects from garnet removal would include removal of water, increased turbidity at the site and downstream, diversion channel construction, temporary stream diversion, channel reconstruction and vegetation removal. In 281 Gulch a 600-foot reach of the stream would be diverted at the rate of approximately 150 feet/year for garnet collection operations. The stream channel would be temporarily relocated and then reconstructed over this total 600 feet. In addition there may be rehabilitation work on up to 745 feet of channel previously worked by garnet mining. A total of approximately one acre of wetland in 281 Gulch would be temporarily disturbed over a period of two to four years during excavation and reclamation (PF: SW-15). The existing road in 281 Gulch would be graveled for stability while returning overburden to the past dig sites and then recontoured along its entire length of 1,850 feet when operations are completed in this drainage.

The stream channel would be reclaimed when garnet gravels are removed based on survey data of existing channel profile, valley and stream channel cross-sections (PF: SW-2, SW-4, SW-7, SW-23, SW-24, SW-26). Reclamation would involve the use of biodegradable fabric (coir, geotextile, etc.) lifts (Figure 18); placement of large woody material; replacing stockpiled topsoil and vegetation; mulching; seeding; and planting (see Appendix C).

Water Quality

Sediment

Indirect effects may include downstream impacts from any increased sediment – increased fine material in the streambed or possible pool filling. Sediment basins, straw bale sediment traps, gravelling, slash-filter-windrows, vegetated buffers, and other design features (Design Features N.1., 4., 9.,14.,16.) would be utilized to prevent sediment from entering the stream system from the recreational operations. Past turbidity sampling at the 2005 dig locations indicates water quality standards were met with one exception when recreational diggers in the East Fork 281 discarded wash-water directly into the stream channel, which caused this aberrant reading. Sediment generation is estimated at approximately 7.5 tons/year with pre-sluice operations, based on previous sediment sampling measured with an ISCO automated sampler in 2002, 2003, and 2004 (PF: SW-74, SW-80).

Temperature

Removal of vegetation for the mining would cause an incremental fraction of increased sunlight on the stream channels (PF: SW-28). The topography of the surrounding landscape and the orientation of the drainages shade the drainage bottoms, so the removal of trees and shrubs would not result in a large increase of sunlight reaching the streams. There would not be a consequential increase in direct sunlight on the stream channel, and no further impairment of beneficial uses is expected within the East Fork Emerald Creek.

A temperature TMDL in the East Fork Emerald Creek calls for increasing stream shading on the main stem of this drainage but not on tributaries (ID DEQ, 2003, p. 91). No change in stream shading will occur on East Fork Emerald Creek. Recent tree seedling plantings (Table 25) are intended to move toward meeting the temperature TMDL and attaining beneficial use support within East Fork Emerald Creek.

Other Pollutants

No change in water quality is expected. No change in any chemical concentration is expected from this activity because no introduction of chemicals is anticipated (Design Features D.1.-4.). Accidental fuel or oil spills are always a possibility, but emergency spill equipment would be required and would be available where equipment is operating. Equipment would not operate in flowing water.

Beneficial Uses

Pollutants of concern for downstream reaches that are listed as Water Quality Limited Segments (WQLS) include: temperature and sediment. No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases are not expected because of the minor change in vegetative cover and rehabilitation planting; and past monitoring indicate sediment levels meet water quality standards at the recreational garnet removal site.

Water Yield

Water Withdrawal

The proposed operation at the recreational garnet collection area is a 'sluice-flume' screening system requiring water to remove garnets from their soil matrix. This is a new form of operation at this site and some 'bugs' may need to be worked out of the system. Permits to appropriate water were granted by the Idaho Department of Water Resources for 1.0 cfs in Garnet Gulch and 0.5 cfs in 281 Gulch (PF: SW-53). Tables below display the various percent streamflow removals (PF: SW-59) needed to initially put water into the system and to replenish water lost from the system. The Forest Service intends to remove only small amounts of existing discharge at any point in time, and given the much smaller values estimated for the withdrawals this should be readily achievable. For lower flow periods the replenishment water withdrawals may need to occur for a few hours daily over a day or more, in order to achieve the lowest percentage of streamflow removal possible. Until the proposed 'sluice-flume' operates for a season, the amount of water withdrawal needed for the annual filling of the settling/holding pond and for replenishing the system can only be estimated. The settling/holding pond may require far less annual recharge than the estimated 10,000-20,000 gallons, due to snowmelt, rainfall or its ability to carry-over water from one year to the next. The estimated 10% per week loss from sluice operation, leaks, evaporation or seepage may be over or under estimated. This quantity can only be determined once the operations are ongoing. By extending the time of water withdrawal, low percentage rates of streamflow removal can be achieved even if the rate of loss is higher than estimated.

The initial water withdrawal percent of the maximum, minimum, average and median values for the 14-year daily average varies by the time period of the withdrawal; the longer the withdrawal the less percentage of average daily values. Water withdrawal is not expected to appreciably or substantially affect wetland hydrology or streamflow because:

4. The vast portion of water withdrawal would occur in the springtime during higher flow periods to fill the holding/settling pond(s) to capacity ('charging the system') for the sluice operations. Because this would be during higher flow, springtime conditions, it would not affect wetland hydrology because the soil would already be saturated. The withdrawal would occur over a 6 to 24-hour period, with a low removal rate to prevent substantial changes in flow, circulation and wetland hydrology.

5. It is anticipated there would be a need to replenish water in the holding/settling pond(s) due to leakage, evaporation, and spills and splashing from the sluice operation. This anticipated need is not expected to be large but cannot be determined until operation of the 'sluice' system has occurred for some period of time. Here leakage and seepage is likely to flow back to the drainage bottom and the wetlands there. The system would be recharged with water from the stream source after review by the District Fish Biologist and District Hydrologist. During dry periods, only a small portion of the stream flow over an extended time period would be removed for augmentation. Additionally, a water truck may be used to supplement if needed.

6. Amount of withdrawal in the initial 'charge' period would be approximately 10,000 - 20,000 gallons, which is the capacity of the holding/settling pond. This is about 0.016 - 0.23 cubic feet per second if drawn over a 24-hour period. If the water withdrawal occurs over a 12-hour time period then this is about 0.031-0.046 cubic feet per second. Or if the withdrawal occurs over a 6-hour period the estimated withdrawal rate is 0.062 - 0.093 cubic feet per second.

Table 20 - 281 Gulch Estimated Daily Discharge (cfs)*

Maximum value	17.10	5.78
Minimum value	0.28	0.20
Average	2.36	1.35
Median	1.58	0.82

**The estimated discharge is based on averaged daily values for mean maximum, minimum, median and average discharge over 14 years of discharge records for the EFK Emerald Creek. The area-discharge relationship for this gauging station (mean discharge per square mile) was used to estimate the amount of discharge for 281 Gulch.*

Table 21 - 24-Hour Withdrawal Rates and % of Daily Discharge

Maximum	0.09	0.14	0.18
Minimum	5.53	8.27	11.02
Median	0.98	1.47	1.96
Average	0.66	0.98	1.31
Maximum	0.27	0.40	0.53
Minimum	7.89	11.81	15.73
Median	1.89	2.83	3.77
Average	1.15	1.72	2.30

10,000 gallons over 24 hours = 0.0155 cubic feet per second
15,000 gallons over 24 hours = 0.0232 cubic feet per second

Table 22 - 12-Hour Withdrawal Rates and Percent of Daily Discharge

Maximum	0.18	0.27	0.36
Minimum	11.02	16.54	22.01
Median	1.96	2.94	3.91
Average	1.31	1.96	2.61
Maximum	0.53	0.80	1.07
Minimum	15.73	23.62	31.42
Median	3.77	5.66	7.53
Average	2.30	3.45	4.59

10,000 gallons over 12 hours = 0.0309 cubic feet per second
15,000 gallons over 12 hours = 0.0464 cubic feet per second

Table 23 - 6-Hour Withdrawal Rates and Percent of Daily Discharge

Maximum	0.36	0.54	0.72
Minimum	22.07	33.08	44.02
Median	3.92	5.88	7.82
Average	2.62	3.93	5.22
Maximum	1.07	1.60	2.13
Minimum	31.51	47.24	62.85
Median	7.55	11.31	15.05
Average	4.60	6.90	9.17

10,000 gallons over 6 hours = 0.0619 cubic feet per second
15,000 gallons over 6 hours = 0.0928 cubic feet per second

Replenishment Water

It is estimated that there may be 10 to15 percent loss of water in the sluice system per week, due to spills and splashing at the sluice, evaporation, and seepage. This would require adding approximately 1,000 - 3,000 gallons to the system per week. This equates to 134 - 400 cubic feet of water per week.

The following tables PF: SW-59) identify the percent of daily flow needed to replenish the estimated 1,000-3,000 gallons loss. Daily flow was estimated for 281 Gulch by extrapolating from 14 years of discharge records for the East Fork Emerald Creek using the area-discharge relationship.

Table 24 - % of Daily Flow Needed to Replenish Loss from Sluice Operation

	% average*	**% median***	**% average***	**% median***
June	0.38	0.75	0.19	0.37
July	0.82	0.93	0.41	0.46
August	2.11	2.44	1.05	1.22
	% average*	**% median***	**% average***	**% median***
June	1.13	2.24	0.56	1.12
July	2.47	2.79	1.24	1.39
August	6.33	7.31	3.16	3.65

**Average mean daily or median mean daily value for the month*

Conclusions

The range of withdrawal rates as percentage of daily flow for the initial filling of the holding/settling pond for the 24-hour or 12-hour time periods is under 25% for even the lowest daily flows estimated for the months of April or May (PF: SW-59). This one-half to one-day initial withdrawal is not expected to have appreciable effects to beneficial uses, water quality, wetland function or structure.

For replenishment water, no appreciable effects to beneficial uses, water quality, wetland function or structure are expected with the estimated less than eight percent (6-hour withdrawal) withdrawal of daily average or median flow during the summer low flow period.

Although the calculations presented here are for 281 Gulch, these values can be extrapolated to Garnet Gulch because the size of Garnet Gulch is similar – 325 acres versus 375 acres – and the difference in discharge is not substantial (PF: SW-59).

A slight decrease in annual water yield would occur from water withdrawals. Water withdrawal from the stream channel would be needed to operate the sluice system. The stream channel would never be completely dewatered through this removal. The withdrawal would typically be used to initially “charge” the sluice operation, but periodic recharges are likely due to sluice operation, leakage, and evaporation. It is the intent to remove only small amounts of water over extended periods. The initial “charging” of the system would occur in April and May during periods of higher spring runoff when removal is not likely to change discharge by consequential amounts that would affect beneficial uses. See Design Features C3, F3e, and N.12 in Chapter 2.

No increase in water yield is expected because no consequential change in vegetative cover would occur from this activity. Significant changes in vegetative cover may influence melt rates (Packer) and water yield if over 20% (Stednick). The proposed activity would not change vegetation levels substantially. A study of causes of peakflows in northern Idaho and northwestern Montana found that peakflows were dominantly climatically driven (MacDonald L.H. and J.A. Hoffman, 1995, p. 94).

Stream Channel Integrity

Cause and Effect: Compromise to downstream channel integrity is not expected because no consequential net increase in sediment or water yield would occur from these activities (PF: SW-74; see Water Yield section above).

Response Potential/Channel Type: None of the channel types found downstream of the proposed activities in the East Fork of Emerald Creek, the main stem of Emerald Creek or the St. Maries River are expected to respond or change from the proposed activities because there would be no consequential sediment or water yield increases (PF: SW-74; see Water Yield section above).

Cumulative Effects

The activities proposed under all alternatives would not have an effect on water quality, water yield, stream channel integrity or beneficial uses as described below.

Past Restoration Activities

Rehabilitation of garnet mining sites in 281 Gulch occur annually in the fall and include mulching and seeding all disturbed sites; installation of silt fence and erosion blankets; reestablishing a stream channel; planting shrubs, sedges and trees; collecting gravel & cobbles from the mine site and using this material to line the newly established channel; log placements within and adjacent to the stream channel. There is typically 100% cover on disturbed sites due to mulching or placement of erosion control blankets (PF: SW-41). Table 25 summarizes restoration activities in the East Fork Emerald Creek.

Activities on Privately-Owned Lands

Activities on private lands include timber harvest, garnet sand mining, grazing, farming, road construction, and perhaps other activities. The sediment accounting system portrayed in the TMDL calls for individual landowners to reduce sediment from their lands and their activities. As identified above there is a reasonable estimate of sediment reduction that includes private activities.

Table 25 – Past Restoration Activities in the East Fork Emerald Creek

E. Fk. Emerald Ck	5,300 spruce planted along stream	2006
E. Fk. Emerald Ck	200 spruce planted along stream	2005
E. Fk. Emerald Ck	600 spruce planted along stream	2002
Emerald Creek	6 miles road obliteration	1992-2002
E. Fk. Emerald Ck	11 miles Road 447 resurfacing	2000-2001
E. Fk. Emerald Ck	Construct 15-acre cattle exclosure	2000-2001
E. Fk. Emerald Ck	Planted (~500) dogwood, willow, cottonwood and cedar within exclosure	2000-2001
E. Fk. Emerald Ck	Drainage improvements and graveling of Road 504	1998
E. Fk. Emerald Ck	Rehabilitation of 11 acres of past mining (Shorty's Dig, Bovine Pine)	1990; 1995-1998
E. Fk. Emerald Ck	20 sediment traps installed in ephemeral drainages in/near clearcuts	1993
E. Fk. Emerald Ck	Install 25-30 fish habitat structures	1992
E. Fk. Emerald Ck	~15 acres of cedar and cottonwood seedlings planted along stream	1992
E. FK. Emerald Ck	20 acre garnet mining site near Emerald Ck. Campground	1966

Water Quality

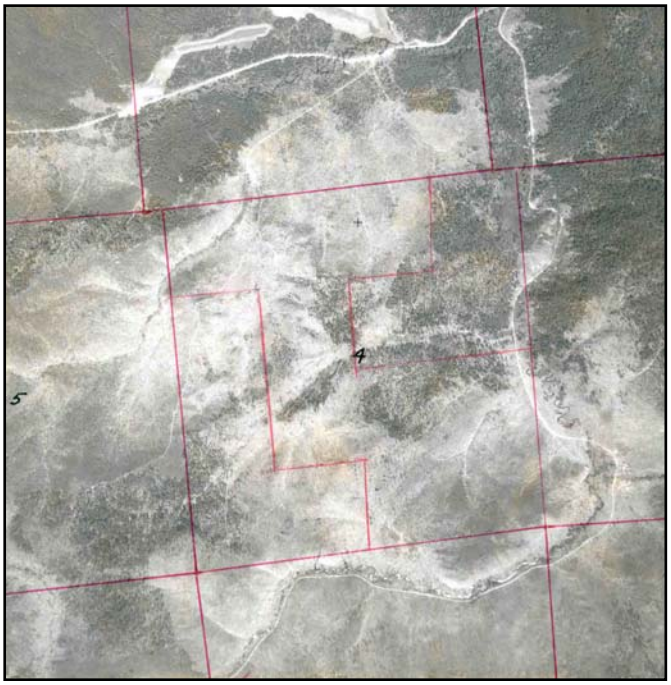
The cumulative effects within the Emerald Creek watershed were assessed in relation to beneficial use support (ID DEQ, 2003) in a sub-basin assessment conducted in 1999 by Idaho DEQ (pers. conv. G. Harvey, DEQ). This is effectively the summary of past cumulative effects (MacDonald, 2000). The Sub-basin assessment identified Total Maximum Daily Loads (TMDLs) for sediment and temperature for landowners within the St. Maries River and some of its tributaries. The TMDL is expected to restore or improve beneficial use support. A current estimate of sediment production from federal land activities (not included in the Idaho DEQ TMDL assessment) shows an estimated reduction of between13.5 and 16.1 tons/year within the East Fork Emerald watershed compared to the value derived from the DEQ 1998 assessment (PF: SW-17, SW-43, SW-44, SW-74). Sediment contributions from all lands in the East Fork Emerald Creek are expected to be reduced by 8.6 to 11.2 tons per year.

Beneficial Uses

No negative effect to beneficial uses is expected from the proposed activities because there is an overall net reduction in sediment, no consequential increase in temperature, and many past and proposed activities are intended to move toward full support of beneficial uses.

Water Yield

There would be no change in water yield cumulative effects within East Fork Emerald, Emerald Creek or St. Maries River from the proposed activity because there would be no consequential water yield increase. Comparison of 1933 aerial photos to 2004 aerial photos shows a large increase in tree cover currently compared to what existed in 1933 in Emerald Creek (Figures19 and 20). The lack of conifers in 1933 is attributed to previous wild fires and/or timber harvest or the presence of natural meadows in the valley bottom. Water yield based only on vegetative cover (PF: SW-81) should be substantially lower currently, compared to 1933. No major tree removal has occurred in the past few years.



No increase in peakflow is predicted from the proposed garnet extraction activity, so no consequential change to cumulative water yield is expected from the proposed activity. As discussed above, water yield and peak runoff are expected to be currently lower in East Fork Emerald Creek compared to 1933. Comparison of reaches of the St. Maries River in the near-downstream vicinity of the mouth of Emerald Creek in 1933 and 2002 aerial photographs shows that no substantial changes have occurred to the stream channel over that time period, which indicates that, cumulatively, any increased water yield is not having a consequential effect.

Stream Channel Integrity

Where there is proposed activity, existing channel dimensions and valley bottom location have been surveyed and would be used to reconstruct and return the channel to its existing condition (unless an alternative design is agreed to for habitat improvement). Reconstruction would enhance aquatic habitat through additions of large woody material. Planting deep-rooted shrubs and trees will provide channel stability.

The existing stream channel in the East Fork Emerald Creek is incised. A comparison of channels mapped from aerial photographs in 1933 and in 1984 (PF: SW-36) shows it has become less meandering, which may have been caused by intentional straightening, beaver extirpation, vegetation removal, mining, increased runoff, railroad and road construction or a combination of these activities.

The incised channel is undergoing evolution to widen and establish a new floodplain within this incised area (Rosgen, 1996; Schumm et al, 1984). Also ongoing beaver activity is occurring in the East Fork Emerald channel. Dams on the stream by beaver will begin trapping sediment causing aggradation and floodplain building. The dams will also raise the water table, which would help in reestablishing vegetation and creating aquatic and wetland habitat.

No additional change to stream channel integrity is expected from the proposed activities because there would be no consequential sediment input nor a change in water yield, therefore, no change to forces (stream power, aggradation, degradation) within the channel (Leopold et al., 1964, Schumm 1977) in EFK Emerald, main Emerald Creek and downstream reaches of the St. Maries River. A comparison of aerial photographs of the St. Maries River from 1933 and 2002 indicates very little change in channel conditions over this time span. Most meander cutoffs and straightening of the channel occurred prior to 1933 (PF: SW-48).

Human activities can influence the morphology of streams, but the effects may not be different from natural conditions or disturbances – magnitudes of certain variables in the geomorphic system may increase [from human activities] resulting in accelerated or decelerated responses in fundamental geomorphic processes. The appropriate [geomorphic] principles are not abrogated (Leopold et al., 1964 p. 434). Natural changes and their consequences are similar to changes induced by human activities (Schumm et al., 1984). Stream channels evolve: an alluvial river is continually changing its shape, dimension and pattern and “it is the rule rather than the exception that banks will erode, sediment will be deposited and floodplains, islands, chutes and side channels will undergo modification with time” (Schumm, 1977, p. 131).

Alternative A

Direct and Indirect

Water Quality

Sediment additions from proposed activities are estimated at approximately 5.0 tons/year (PF: SW-74) although design criteria may reduce estimated sediment generated during channel reconstruction. The sediment measured with an ISCO™ sediment sampler (2.6 tons/year) of previous operations included in the sediment estimate is likely inflated because of the small size of the channel which allowed sediment to become dislodged from the bottom and sides of the channel during the sampler’s purge cycle. There also were small spikes in sediment levels following the adjustment of the sampler’s intakes in the stream channel.

The topography of the surrounding landscape and the orientation of the drainages shade the drainage bottoms, the removal of trees and shrubs would not result in a large increase of sunlight reaching the streams, and shrub and tree planting will eventually shade streams; so temperature would not increase.

Water Yield

Water withdrawal up to 0.5 cfs is permitted through a water right in 281 Gulch (PF: SW-53). With most water withdrawal planned for higher flow periods, because of the need to “charge” the system for operations to begin on the Memorial Day weekend, no downstream effect is expected from this withdrawal. Incidental recharging of the system can utilize overnight and multiple day withdrawals at very low withdrawal rates, which would not dewater the channel or remove more than one third of existing flow; and no effect is expected.

Stream Channel Integrity

The effects to stream channel integrity discussed above in the Common to All Alternatives section applies to Alternative A, except there is no activity in Garnet Gulch.

Road Densities

With the recontouring of Road 3781, road densities would be 4.95 miles/sq. mile in East Fork of Emerald Creek (PF: SW-60).

Cumulative Effects

For activities on National Forest System land in the East Fork Emerald Creek watershed it is estimated that there would be a net reduction in sediment of approximately 13.5 tons/year based on information not included in the Idaho DEQ TMDL assessment (PF: SW-35, SW-43, SW-44, SW-73, SW-74). The reduction would be about 11 tons for the year that rehabilitation of the stream channels from past activities takes place, but then in subsequent years the reduction would be back to about 13.5 tons/year. Cumulatively the reduction would be about 8.6 tons when new road construction on private land is included.

Cumulatively, adding the identified of 1.9 miles of road construction on private land to the recontouring of the road in 281 Gulch, road densities would be 5.07 miles/sq. mile for the East Fork of Emerald Creek (PF: SW-60).

Alternative A is not expected to impact water yield, stream channel integrity, or introduce chemical pollutants into the streams (all discussed above); nor further impair beneficial use support through consequential sediment introduction or temperature increases. Therefore no increase in cumulative effects is expected, and given the 24-ton/year (which includes road construction since 1999, on private land) reduced sediment levels (PF: SW-74) and increased plantings in riparian areas Alternative A should improve the trend toward beneficial use support.

Alternatives B and C

Under these alternatives activities are proposed in both 281 Gulch and Garnet Gulch. The proposed activity in Garnet Gulch includes road and parking area construction in both alternatives. Garnet Gulch operations would include building 0.68 miles of new road under either alternative. Alternative B would include clearing a one-acre area for the administrative site, and Alternative C would include clearing a three-acre area for the administrative site. In Garnet Gulch the new road construction, parking lot, operating area and the administrative site for Alternative B would have activity on 4.5 acres and in Alternative C about 6.5 acres.

Direct and Indirect Effects

Water Quality

Project activities would add approximately 5.1 tons/year (PF: SW-74), although design criteria requiring a geotextile channel lining may reduce estimated sediment generated during channel reconstruction. The sediment estimate from the automated sampler (ISCO™), a value of 2.6 tons/year (PF: SW-82), is likely inflated because of the small size of the channel which allowed sediment to become dislodged from the bottom and sides of the channel during the sampler's purge cycle. There also were small spikes in sediment levels following the adjustment of the sampler's intakes in the stream channel. None the less, these values were used in the overall sediment estimate for East Fork Emerald Creek.

Stream temperatures should not increase because the topography of the surrounding landscape and the north-south orientation of the drainages shade the drainage bottoms, the removal of trees and shrubs would not result in a large increase of sunlight reaching the streams (PF: SW-74), and shrub and tree planting will eventually shade streams.

Beneficial Uses

No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases are not expected; and turbidity levels meet Idaho Water Quality Standards, though a minor sediment increase is documented in slightly increased turbidity levels; sediment increases documented above are offset through pollutant trading (see Cumulative Effects section and PF: SW-74). Indirect effects include downstream impacts from any increased sediment – increased fine material in the streambed and possible pool filling.

Water Yield

Water withdrawal up to 1.0 cfs is permitted through a water right in Garnet Gulch (PF: SW-53). With most water withdrawal planned for higher flow periods, because of the need to "charge" the system for operations to begin on the Memorial Day weekend, no downstream effect is expected from this withdrawal.

Incidental recharging of the system can utilize overnight and multiple day withdrawals at very low withdrawal rates (PF: SW-59) which would not dewater the channel, and no effect is expected to beneficial use support.

No substantial increase or decrease in water yield is expected because no consequential change in vegetative cover would occur from this activity to increase water yield, and the withdrawal is not expected to substantially reduce low flow rates. Changes in vegetative cover may influence melt rates (Packer), and increase water yield if over a 20% reduction (Stednick) which is not the case for this project.

Stream Channel Integrity

The discussion above in the Common to All Alternatives section applies to both Alternatives B & C for effects to stream channel integrity. No compromise to stream channel integrity is expected in the East Fork Emerald Creek, or downstream because no consequential increase in sediment (PF: SW-74) or substantial change in water yield would occur from these activities.

The channels in 281 and Garnet Gulches would be restored to resemble their existing condition by using surveyed valley and stream channel cross-section and profile data (PF: SW-2, SW-4, SW-23, SW-24, SW-26) in their reestablishment after garnet gravel extraction (unless an alternative design is agreed to for habitat improvement).

Road Densities

Road densities would be 4.98 miles/sq. mile for the East Fork of Emerald Creek when the road in 281 Gulch is recontoured, and the road for Garnet Gulch operations is constructed (PF: SW-60).

Cumulative Effects

Water Quality

Sediment levels from National Forest System land have been reduced (or will be reduced with reasonably foreseeable proposed activities) by an estimated 13.5 tons/year (PF: SW-74). But additional sediment from roads constructed on private land would lower the estimated sediment reduction to about 8.6 tons/year (PF: SW-74). This sediment reduction is in accordance with the TMDL for the St. Maries River.

On private land within the East Fork Emerald Creek new road construction has occurred since the St. Maries Subbasin Assessment and TMDL. Approximately 10,000 feet of road has been constructed on privately-owned land since 1999 (pers. comm. J. Walter and D. Baker, 1/2006, Potlatch Corp.) This additional road would contribute about 4.9 tons/year (PF: SW-74). Cumulatively this would mean that sediment would only be reduced by about 8.6 tons/year within this watershed (PF: SW-74).

Road Densities

Cumulatively adding the identified road construction on private land of 1.9 miles to the recontouring of the road in 281 Gulch, and construction of the road in Garnet Gulch road densities would be 5.09 miles/sq. mile for the East Fork of Emerald Creek (PF: SW-60).

Consistency with Forest Plan and Other Laws and Regulations

Forest Plan

The proposed activities would not affect long-term productivity of the water resource because there would be an overall sediment reduction in East Fork Emerald Creek, and turbidity monitoring at the garnet removal site shows current activities meet water quality standards.

BMPs and design criteria would be applied to the proposed activities. The Forest Service has applied for and expects to receive a Stream Alteration Permit. Any conditions deemed necessary in this or other permits (404) would be followed.

Planned water withdrawals will not substantially reduce streamflow in either Garnet or 281 Gulches as documented above.

The proposed activities are not occurring near a public water system or in a municipal watershed.

Stream Channel Integrity as discussed above would not be compromised by the proposed activities in reaches of 281 or Garnet Gulches or downstream.

INFISH

Riparian Habitat Conservation Area Management Objectives would not be compromised with implementation of all design criteria discussed in Chapter 2. Channel reclamation following relocation or reconstruction may actually achieve, or move conditions toward meeting, the RMOs through incorporation of large woody debris, constructing pools, and planting in riparian areas. Removing timber within the RHCA is in accordance with INFISH RMOs because the timber would be used for large woody material in the channel and on the floodplain.

Executive Order 11988

Floodplain size, elevation and function would not be substantially altered because there is survey data of the existing condition and this data would be used in reclamation of the proposed activity areas. Wetland size and function would not be appreciably altered because of rehabilitation, reclamation, and application of design criteria.

Clean Water Act and Idaho Water Quality Law

The State of Idaho Department of Environmental Quality certified that the project will comply with the Clean Water Act and will not violate Idaho Water Quality Standards (PF: SW-84). Idaho Water Quality Law is met with the implementation of design criteria, because the pollutant sediment would be reduced cumulatively and no appreciable increase in temperature is expected. Channel reclamation following relocation and reconstruction may actually achieve, or move conditions toward meeting, the RHCA objectives through incorporation of large woody debris and planting significant amounts of vegetation in riparian areas, which would also continue toward the trend of supporting beneficial uses.

WETLANDS

Regulatory Framework

Clean Water Act

Amendments to the Federal Water Pollution Control Act (1948), include Part 230, Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (1970); and is now referred to as the Clean Water Act (1977) (PF: SW-9, SW-70). Section 404 of the Clean Water Act (CWA) established a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States. Wetlands subject to CWA Section 404 are defined as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (PF: SW-9).

Executive Order 11990 Protection of Wetlands

The Wetlands Protection Order directs that each agency shall provide leadership and shall take action to *minimize* the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands (Section 1(a)); and to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is *no practicable alternative* to such construction and (2) that the proposed action *includes all practicable measures to minimize harm* to wetlands which may result from such use (Section 2(a)) (emphasis added) (PF: SW-56). The term "*practicable*" means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (40 CFR Part 230.3.q; PF: SW-9).

Existing Condition

The classification system developed by Cowardin and others, (1979) for the US Fish and Wildlife Service (FWS) was used to classify the existing wetlands. Where activity is proposed in 281 Gulch (one acre) and Garnet Gulch (2.2 acres), the wetlands are classified as palustrine, emergent wetland, persistent, seasonally flooded (PEM1b), or from the legend used in the FWS National Wetland Inventory maps it would be palustrine, emergent wetland, persistent, seasonally flooded/saturated (PEM1E). From personal observation, these wetlands are not unique (geographically isolated, rare or having highly diverse vegetation) and are found throughout the lower portions of these drainages. In general, the East Fork Emerald Creek wetlands in the drainage bottom are classified as riverine, unconsolidated bottom, permanently flooded; riverine aquatic bed intermittently exposed; riverine, emergent, nonpersistent, semi-permanently flooded; palustrine, emergent, persistent, seasonally flooded; and palustrine, scrub/shrub, temporarily flooded.

After reviewing the Conservation Strategy for Spokane River Basin Wetlands (Jankovsky-Jones, 1999; PF: SW-13) and the classifying scheme presented therein and examination of EPAs Review of Rapid Assessment Methods for Assessing Wetland Condition (PF: SW-42); the wetlands associated with the extraction of garnet resources from 281 and Garnet Gulch should be considered Habitat Sites. Because of the presence of the rare plants identified in botany surveys some might categorize the wetlands as Class II Sites; however, these wetlands should not be considered unique just because of the presence of *R. nudum* and *B. spicant*. Surveys conducted outside of the project area in the general vicinity have also discovered populations of these plants. In addition, the populations of rare plants within the project area are considered secure, as project activities would affect only a portion of the population in Garnet Gulch.

The typical plants found in the wetlands associated with the proposed activities are: Shrubs including *Alnus incana* and *Cornus sericea* with some *Rhamnus alnifolia*, *Sorbus sitchensis*, and *Rubus parviflora*. Graminoids include *Glyceria striata*, *Scirpus microcarpus*, *Carex aquatilis*, *Carex amplifolia*, *Deschampsia elongata*, and *Deschampsia caespitosa*. Forbs include *Rudbeckia occidentalis*, *Trautvettaria caroliniensis*, *Senecio triangularis*, *Liguisticum canbyi*, *Tiarella trifoliata*, and *Gymnocarpium dryopteris*.

The extent of wetlands associated with the proposed garnet gemstone extraction was estimated for the tributaries of the East Fork Emerald Creek. It is based on the total length of stream channel from the St. Joe stream coverage in GIS ARCVIEW and measured wetland widths and length. The East Fork Emerald stream channel length is approximately 377,400 feet (PF: SW-19).

From personal observation existing vegetative and organic cover ranges from 80-99% in the wetland areas (PF: SW-66). The cover value is generally at the higher end, but some exposed soil in distributary channels and from gophers or other animal activity exists.

Environmental Consequences

Common to All Alternatives

The extent of wetland and stream channel disturbance associated with the proposed garnet gemstone extraction was estimated for the East Fork Emerald Creek. Based on the total length of the East Fork of Emerald Creek, the estimated annual level of disturbance (150 ft.) to stream channels is 0.04% of the total

within the East Fork Emerald Creek watershed. The length of annual disturbance in 281 Gulch is estimated at 150 feet; and there is an average wetland width of 45 feet (PF: SW-15, SW-27), so the annual estimated disturbance in wetlands in 281 Gulch would be 0.16 acre or 6,750 sq. ft.

Direct effects from garnet removal would be removal of water, diversion channel construction, temporary stream diversion, vegetation removal, and channel reconstruction. In 281 Gulch a 600-foot reach of the stream would be diverted at the rate of approximately 150 feet/year for garnet removal operations. The stream channel would be temporarily relocated and then reconstructed over the total 600 feet. In addition there may be rehabilitation work on up to 745 feet of channel previously worked by garnet mining. A total of approximately one acre of wetland would be temporarily disturbed during excavation and reclamation. The rate of wetland disturbance would be approximately ¼ acre per year.

Wetlands would be reclaimed through replacing stockpiled topsoil and vegetation and subsequent seeding and planting (PF: SW-7; see Appendix A). The replacement of excavated material including gravel lenses, substratum, topsoil and stockpiled vegetation, in the order that they were removed would prevent appreciable impacts to wetlands through loss of wetland function or area. Flow or circulation through the wetland areas would not change appreciably because there would be a small amount of annual disturbance (0.16-0.19 acre) in wetland area; proposed water withdrawals are likely to occur during high flow periods to fill holding/settling ponds in the flume system or consist of minor withdrawal amounts to add to the holding/settling ponds to make up for expected small losses due to spillage, seepage and evaporation; current survey data of valley and channel cross-sections and longitudinal profiles would be used to reconstruct channels after excavation; and each reconstructed panel surface, both wetland and channel(s) would match upstream and downstream valley and channel elevations and channel locations. All alternatives include parking lot removal and floodplain/wetland rehabilitation of 0.5 to1.5 acres along East Fork Emerald Creek.

The monitoring plan includes standards for vegetation that identify biological recovery of the site, which in turn is indicative of hydrologic recovery. It also includes a standard for monitoring saturated soil conditions. Monitoring may indicate that further response (replanting or transplanting adjacent wetland species) is needed as an adaptive management technique to allow and promote full recovery of the wetland (see Chapter 2, Monitoring and Appendix C). An area adjacent to the East Fork of Emerald Creek (Shorty's Dig) was rehabilitated in the early 1990s following garnet extraction. Wetland areas were constructed and are functioning properly in 2006 (PF: SW-45).

Water withdrawals are not expected to result in appreciable effects to wetlands (See Watershed section for details). The range of withdrawal rates as percentage of daily flow for the initial filling of the holding/settling pond for the 24-hour or 12-hour time periods is under 25% for even the lowest daily flows estimated for the months of April or May (PF: SW-59). This one-half to one-day initial withdrawal is not expected to have appreciable effects to beneficial uses, water quality, wetland function or structure. For replenishment water, no appreciable effects to wetland function or structure are expected with the estimated less than eight percent (6-hour withdrawal) withdrawal of daily average or median flow during the summer low flow period. Although the calculations presented here are for 281 Gulch, these values can be extrapolated to Garnet Gulch because the size of Garnet Gulch is similar (375 acres versus 325 acres) and the difference in discharge is not substantial (PF: SW-59).

The EIS discloses potential effects to both flora and fauna associated with the wetland areas proposed for garnet gemstone extraction in the Rare Plant, Fisheries and Wildlife sections.

Alternative A

Direct and Indirect Effects

No wetlands would be lost from project activities. One acre in 281 Gulch of wetlands would be temporarily disturbed during excavation and concurrent reclamation. Approximately 1.5 acres of floodplain/wetland would be reestablished along East Fork Emerald Creek through parking lot removal at Pee Wee Gulch and 281 Gulch.

Cumulative Effects

No wetlands would be lost from proposed or reasonably foreseeable future activities. See discussion of direct and indirect effects above.

Alternatives B and C

Direct and Indirect Effects

The length of proposed annual disturbance in Garnet Gulch is estimated at 150 feet; and there is an average wetland width of 56 feet (PF: SW-15, SW-27), so the annual estimated disturbance in wetlands in Garnet Gulch would be 0.19 acre or 8,400 square feet. For the entire project including both Garnet and 281 Gulches the estimated long-term overall level of disturbance (2,300 ft.) to stream channels in the East Fork Emerald Creek watershed is 0.6% (PF: SW-19).

No wetlands would be lost from project activities. In addition to effects described in the Common to All Alternatives section above, approximately 2.2 acres of wetlands in Garnet Gulch and one acre of wetlands in 281 Gulch would be temporarily disturbed during excavation and reclamation (included in the total disturbance levels of 4.5 acres in Alternative B and 6.5 acres In Alternative C). Wetlands would be reclaimed through replacing stockpiled topsoil and vegetation and subsequent seeding and planting (PF: SW-7, SW-41 and Appendix A). The annual rate of wetland disturbance when excavating riparian areas may be about one quarter acre in 281 Gulch and about 0.35 acre in Garnet Gulch (PF: SW-15). The planned removal and restoration of parking area at Pee Wee Gulch along the East Fork Emerald Creek may increase floodplain and wetlands by about 0.5 acre, resulting in a net increase in wetlands and floodplains.

Cumulative Effects

No wetlands would be lost from proposed or reasonably foreseeable future activities. See discussion of direct and indirect effects above.

Clean Water Act

The purpose of the Clean Water Act is to restore and maintain the chemical, physical and biological integrity of waters of the United States through the control of discharges of dredged or fill material (PF: SW-9). The Forest Service applied for a CWA 404 permit for dredge and fill operations in wetlands of Garnet Gulch and 281 Gulch (PF: SW-85). Activities associated with the proposed garnet extraction are not expected to alter, add, or appreciably increase chemical pollutants or minerals because *in situ* material would be returned to the area it would be excavated from, and no mineral or chemical discharge is anticipated. Design features, including requiring the presence of hazardous material containment kit(s) at the site and by equipment contractors; and the minimum distance from flowing water for refueling equipment during operations would prevent adverse effects from accidental spills of fuel or oil from machinery.

Substantial change to physical characteristics of the wetland is not expected because: 1) Design features call for stockpiling topsoil and substratum in layers and then replacing as near as possible to pre-existing conditions, so no appreciable change to the wetland substrate or wetland surface (PF: SW-9) is anticipated; 2) Suspended particulate matter (turbidity) has been within the State water quality standard during recent operations; 3) Water current patterns, water circulation, and direction and velocity of water flow are not expected to change because of replacement of stream channels, soil horizons, substratum, gravel lenses (etc.), *in situ* or as close to *in situ* as possible; 4) No appreciable change in streamflow; and 5) No change in timing of flows. Effects to flora and fauna are documented in the Rare Plant, Wildlife and Fisheries sections.

Executive Order 11990 Protection of Wetlands

Wetland size and function would not be appreciably altered because of rehabilitation, reclamation, and application of design features. The alternatives would meet Executive Order 11990 because there is no ‘practicable’ alternative to disturbing the wetland areas to recover garnet gemstones and because immediate reclamation of the wetlands would ‘minimize harm’ and restore wetland function (PF: SW-56).

WILDLIFE

Introduction

This section displays and discusses the existing condition of wildlife habitat and relevant wildlife species in the project area and wildlife analysis area; and then displays the potential direct, indirect and cumulative impacts to wildlife that could result from implementation of the proposed action(s) or alternatives.

Regulatory Framework

The regulatory framework providing direction for the protection and management of wildlife habitat comes from a number of sources, including:

- The Endangered Species Act of 1973 as amended (ESA),
- The National Forest Management Act of 1976 (NFMA), and
- The Forest Plan for the Idaho Panhandle National Forests (IPNF) - 1987 (FP).

Section 7 of the ESA directs federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat.

NFMA provides for balanced consideration of all resources. It requires the Forest Service to plan for diversity of plant and animal communities. Under its regulations, the Forest Service is to maintain viable populations of existing and desired species, and to maintain and improve habitat of management indicator species.

The Forest Plan, in compliance with The National Forest Management Act of 1976 (NFMA), established Forest wide management direction, goals, objectives, standards and guidelines for the management and protection of wildlife habitat and species, management indicator species, sensitive species, and threatened and endangered species.

Other laws and orders provide additional direction and influence the analysis of potential impacts on wildlife (e.g. NEPA). Direction concerning implementation of the laws and regulations can be found in Forest Service Manuals (FSM) and various letters/memos from the Forest Service's Washington Office, Regional Office, and the IPNF Supervisor’s Office.

Geographic Scope

The geographic scope of potential effects on wildlife for this analysis was determined based on the location of the proposed federal action and the home ranges/territories of species that may be impacted.

Direct and indirect effects are assessed within and adjacent to the areas where activities would occur (e.g. areas proposed for mining and adjacent stands as appropriate).

The wildlife analysis area for cumulative effects (Figure 21) is approximately 6,950 acres. The analysis area is a part of a block of predominately NFS land with 94% of the area under Forest Service administration. The analysis area was delineated to facilitate an analysis at a home range scale of most wildlife species of interest (when needed for cumulative effects on wide-ranging species a larger landscape area was evaluated), to provide a baseline of existing conditions and analysis of effects focusing on NFS lands, and to encompass reasonably foreseeable activities and/or other planned actions in the area.

The area was delineated using a combination of topographic features (e.g. East Fork of Emerald Creek) and ownership boundaries. Ownership boundaries were used because while they represent political lines on a map they also represent very real biological differences in existing and future habitat conditions on the ground - due in large part to land management objectives. This allows the analysis to display effects in the context of suitable habitat on NFS lands and acknowledges the likelihood that private timber company lands will not – over any extended period of time - provide suitable habitat for many wildlife species (e.g. species

associated with mature forest structure). Therefore such habitat - and occupied home ranges - will be provided primarily on NFS lands.

For some species, habitat adjacent to the wildlife analysis area was considered in the analysis (e.g. for cumulative effects). For other species, due to the nature of species occurrence, home range sizes, distribution of capable/suitable habitat, the scope of the alternatives and lack of impacts throughout the wildlife analysis area, the geographic scope of the analysis was reduced to more closely match home range sizes or restricted to the area(s) of potential impact. Unless stated otherwise the analysis area for habitat/species is the Emerald Creek Garnet Area wildlife analysis area. When it varies a more specific description of the geographic scope of the analysis is found under each habitat or species/guild section of this document.

Analysis Methods

The appropriate methodology and level of analysis needed to determine potential effects is influenced by a number of factors including: the scope of the proposed action, the potential for impacts, the potential risk to resources and species, and the information necessary for an informed decision. The analysis is done at different levels of intensity (e.g. medium filter - fine filter) as appropriate to address the risks and concerns for a given resource/species. The following documents and or sources provide direction and information used to develop the analysis for potential effects on wildlife.

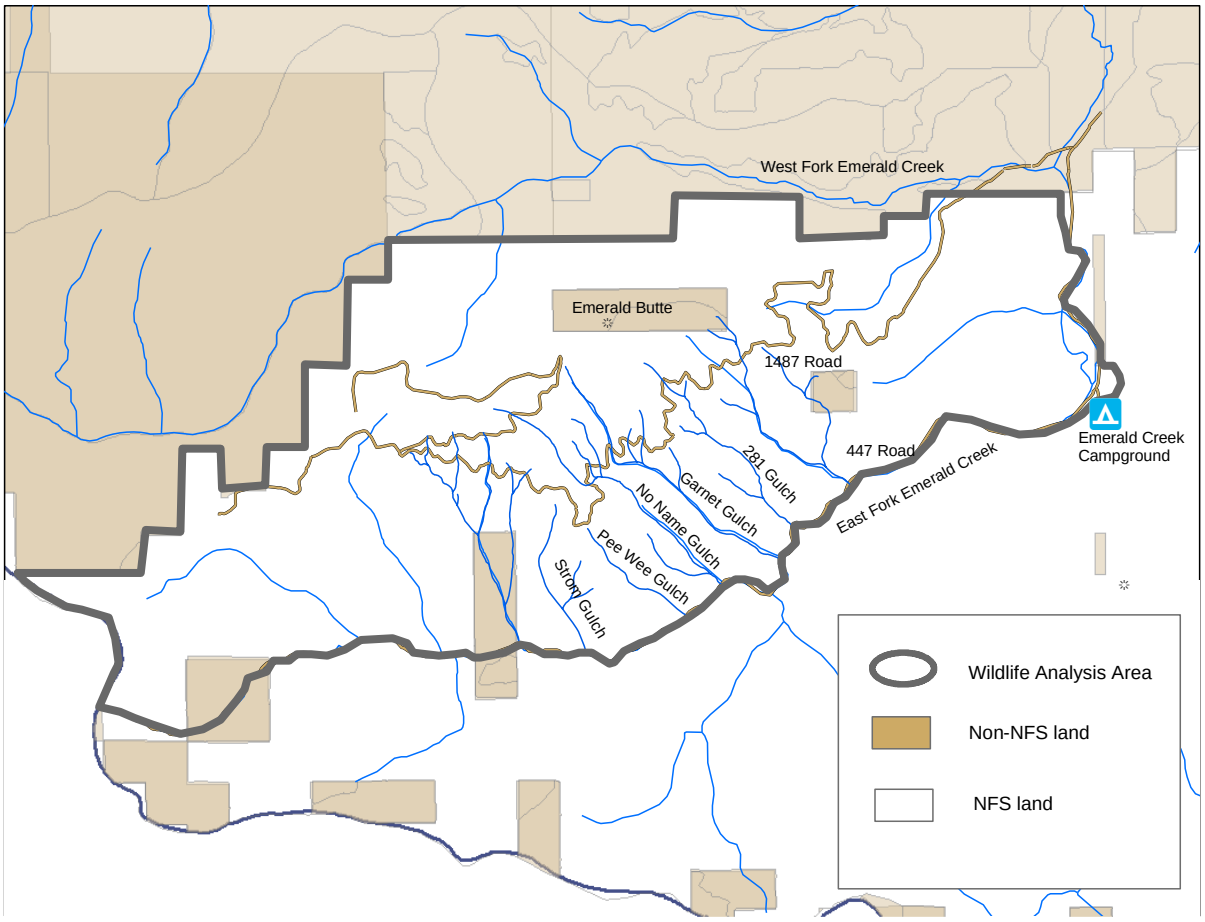
- The Forest Plan for the Idaho Panhandle National Forests
- The Forest Service Manual
- *Integration of Forest Planning into Ecosystem Management: Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area* (St. Joe Geographic Assessment)
- Available Conservation Assessments and Strategies, models, and papers for wildlife species
- Additional scientific literature as appropriate – e.g. pertinent to the species and/or location.

The analysis evaluates habitat in terms of human disturbance, the capability and suitability of vegetation (e.g. structure and composition), and other habitat elements (e.g. standing water and seeps/springs). For the purposes of this analysis, capable habitat is wildlife habitat that has the fixed attributes that enable it to produce habitat requirements for a given species currently or in the future. These fixed attributes include soils (or parent material, or landtype), slope, aspect, elevation, and habitat type. Suitable habitat is wildlife habitat that currently has both the fixed and the variable stand attributes that enable it to produce habitat requirements for a given species. Variable attributes change over time and may include seral stage, cover type, stand density, tree size, stand age, or stand condition.

All past, present, and reasonably foreseeable future activities [Chapter 2] in the pertinent analysis area(s) are considered in the wildlife analysis; and, throughout this analysis the existing conditions are a result of and reflect past actions. However, those actions vary in their impacts and consequences on wildlife. Some activities may influence impacts on wildlife but have no measurable effect that can be directly or independently attributed to the action. For example, road maintenance may contribute to disturbance levels but is a part of the impact measured by road densities; and planting affects habitat suitability but is a part of the analysis of forest structure and is captured in queries for habitat suitability (PF: WL-1).

Queries of available stand data (TSMRS/FsVeg) and information from field reviews and surveys were used to identify types of habitat and capable and suitable habitat for wildlife species. This data was reviewed and found to represent conditions on the ground (WL-1). Changes in habitat conditions and habitat for species are disclosed and a discussion of the effects is displayed. The available data is more detailed for National Forest System (NFS) administered lands within the wildlife analysis area than for non-NFS land. The ownership pattern (i.e. relatively large and relatively contiguous block of NFS land surrounded by other ownerships) allows for adequate analysis of direct, indirect and cumulative effects for most species with the data from NFS lands only. Where information on non-NFS land is crucial to the analysis of effects (primarily for cumulative effects), a combination of visual evaluation, photo interpretation, and extrapolation from data on NFS land was used to assess habitat.

Figure 21 - Emerald Creek Garnet Area Wildlife Analysis Area



When needed, potential cumulative effects on non-NFS lands are evaluated based on past/present practices, management objectives, available information, and assumptions of probable/possible activities. Due to the lack of detailed data, effects from activities on non-NFS lands are difficult to quantify and qualify. They are therefore measured in more general terms than effects from activities on NFS lands.

For most wildlife species, the interaction of disturbance of forest vegetation (both human-caused and naturally-occurring) and forest succession determine the quality and quantity of habitat on a spatial and temporal scale. The existing condition and availability of habitat in the landscape will change regardless of management actions. This change could be rapid and obvious (e.g. a stand-replacing wildfire) or slow and imperceptible (e.g. stand aging). As they pertain to this analysis, natural changes are random, unpredictable, and can't be measured for this analysis. Forest succession normally takes place at a rate that is essentially too slow to measure within the temporal scale of this project level analysis. However, because of its long-term effect and the existing condition of stands in the project area (e.g. ages close to but not yet mature) its effects are considered.

The fire history and human activities in the Emerald Creek Garnet Area wildlife analysis area and surrounding landscape have influenced the availability and distribution of wildlife habitat present today, particularly the level of late successional habitat and – indirectly - the acres of security.

At a landscape scale, land ownership patterns influence the availability of suitable habitat for some species, particularly species with large home ranges. The landscape surrounding the Emerald Creek Garnet Area wildlife analysis area (e.g. Emerald Creek, W.F. St. Maries River, Middle F. St. Marie River) contains

significant amounts of non-NFS land (see Figure 21 and WL-2) including lands owned, managed and/or administered by: private timber companies, state agencies, and private individuals.

The dominant influences (e.g. road densities, amount and distribution of forest structures) on the abundance and distribution of many threatened, endangered, sensitive, and management indicator species are the result of past and current management activities on both non-NFS and NFS land. The management objectives on most non-NFS forested lands emphasize timber management and much of the land owned by private individuals is not forested (e.g. open fields). Subsequently, these lands do not contribute to wildlife habitat such as mature/old forest structures or they provide it at inherently low levels. Also, management objectives and practices on non-NFS lands tend to limit secure areas away from open/used roads. These landscape conditions then, regardless of conditions on NFS lands, not only influence the species present in the wildlife analysis area and the need to analyze potential effects, they also influence the methodology and level of analysis needed for an informed decision.

The nature and scope of the proposed actions and the associated potential impacts also influence the methodology of the analysis. For example, due to the location of the garnet resource, most potential impacts would be in and/or adjacent to streams and riparian areas. This then limits the area of potential impacts and limits (but doesn't necessarily eliminate) the need for detailed analysis on much of the upland habitat.

Acre figures displayed in the wildlife section come from the TSMRS/FsVeg database. All data reflect the impacts from past actions. All values should be considered approximate due to such factors as rounding of acres and combining/grouping of stands. Stand delineation and the resolution of that delineation may also affect how potential effects at a fine filter level are measured and displayed. For example stands adjacent to streams that may be classified as mature size class also include the narrow riparian habitat that may or may not be forested. When appropriate or needed (e.g. at a finer level) the analysis will be based on the existing condition at a finer resolution.

More specific discussions of analysis methods can be found under the section for each species or group of species.

Species Relevancy Screen

The National Environmental Policy Act (NEPA) directs the agency to focus on a full and fair discussion of significant issues, and identify and eliminate from detailed study the issues that are not significant. Wildlife habitat and/or species require varying degrees of analysis to determine potential effects. Some may require relatively detailed analysis with quantitative and qualitative display of information and others may need a less involved analysis.

Threatened, endangered and sensitive (TE&S) wildlife species, Management Indicator Species (MIS) for the St. Joe and additional species of interest that are known or suspected to occur on the IPNF were screened for their relevancy to the St. Joe River drainage and Emerald Creek Garnet Area project. Sighting records, planning documents and other sources (e.g. scientific literature) were reviewed in assessing relevancy. Sources include but are not limited to the Hidden Cedar EAWS and the Emerald Resource Unit FEIS. Relevancy is also based on field visits and survey results.

A coarse filter screen was applied at the St. Joe River Drainage level and then a finer filter screen was used to assess species relevancy at the analysis area level. Information and data used in this screening process is also used to assess the level and intensity of analysis needed to address the concern for potential impacts from the proposed action.

The assessments of the potential for effects made in this screen consider the scope and nature of the activities associated with the proposed action and alternatives, the potential risks for adverse impacts, and the ability to determine potential effects based on available information at the time of this phase of the analysis. If the potential for effects cannot be determined with a reasonable degree of confidence in the screening process then additional analysis will be conducted and documented in the EIS. No further discussion and analysis is necessary for species or habitat not present within the affected area.

Table 26 displays the results of the relevancy screening process and provides an explanation of the rationale. Additional information on species not requiring further analysis and the rationale is discussed following the table or is in the project file (WL-3).

Rationale for No Further Analysis

The St. Joe Drainage and/or the analysis area does not provide sufficient capable or suitable habitat for the woodland caribou, grizzly bear, common loon, or northern bog lemming. These species do not occur in the area, and there would be no effect on them or their habitat. Additional discussion regarding these species and their habitat/occurrence are documented in the project file (WL-3 & 4).

It can be determined at this time that there would be no effect or there is no benefit/need of further analysis for the Canada lynx, peregrine falcon, black swift, harlequin duck, Townsend's big-eared bat, Coeur d'Alene salamander, and forest land birds. The rational for this conclusion is documented below and in the project file (WL-3).

Canada Lynx

Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare. In the St. Joe River Subbasin lynx habitat generally occurs above 4,000 feet in subalpine fir forests or - cedar/hemlock habitat types when in association with subalpine fir and spruce habitat types.

Characteristics of foraging habitat include a dense, multi-layered understory that provides cover and browse at ground level and at varying snow depths throughout the winter. Habitats that support their primary prey include early successional stages resulting from natural disturbance and timber harvest. Older forests with a substantial understory of conifers or small patches of shrubs and young trees also provide lynx foraging habitat.

The common component of natal den sites appears to be large woody debris. Den sites may be located within older regenerating stands or in mature conifer. For denning habitat to be functional it must be in or adjacent to foraging habitat.

The "Canada Lynx Conservation Assessment and Strategy" (Ruediger et. al. 2000) provides direction for management of lynx on federal lands. As part of the programmatic planning standards, Lynx Analysis Units (LAUs) were delineated (in collaboration with the USFWS) to facilitate project planning. Based on the forest types, potential vegetation, and elevation the Emerald Creek Garnet Area was not included in any LAU and is not considered capable of providing sufficient habitat for lynx. The geographic location of the project precludes the potential for effects on the species. Therefore, activities in the Emerald Creek Garnet Area Project will have no effect on lynx under any alternative.

Peregrine Falcon

Peregrine falcons are seasonal migrants to northern Idaho, nesting in the northern temperate regions while wintering in the US and southward. They nest on cliffs that are typically higher than 100 feet, with overhanging ledges or potholes and a vertical surface that provides protection from predation. Foraging areas associated with nest sites can include wooded areas, marshes, grasslands and open water.

There are no known historic eyries or capable/suitable nesting habitat in the wildlife analysis area. The species is not known or suspected to occur in the area. The absence of capable nesting habitat precludes the potential for effects on habitat or the species.

Black Swift

Black swifts require moist cliff environments for nesting. They nest behind or next to waterfalls and wet cliffs, or in shallow caves. Generally, there are five factors present at nest sites: water, high relief, inaccessibility, out of direct sunlight, and unobstructed flyways. Black swifts feed on insects and forage over forests and in open areas. Risks to the species include: 1) decreases in waterflow, 2) recreational use of nest sites (e.g. rock climbers and hikers), and 3) use of pesticides near nesting areas.

There are no waterfalls, wet cliffs, or shallow caves in the wildlife analysis area that may serve as potential habitat. The species is not known or suspected in the project area. Based on the lack of capable/suitable habitat and occurrence there would be no impact on habitat or the species.

Harlequin Duck

Harlequin ducks winter on the ocean and migrate inland to breed. In Idaho, harlequin ducks are strongly associated with swift flowing streams and a cobble to boulder substrate (Cassirer & Groves 1991). Harlequin ducks are primarily affected by disturbance within two 'sight distances' (or about 200' depending on density of streamside vegetation) of a nesting stream (Cassirer et al, 1996 ***)***. Risk factors for harlequin ducks include changes in nesting habitat integrity and disturbance during nesting season. Water quality standards relative to harlequins are primarily to protect their invertebrate food base.

The St. Maries River and its tributaries are not considered harlequin duck habitat (Cassirer et. al., 1996). The geographic location of the project precludes the potential for effects on the species. Based on the absence of suitable habitat and the scope of the proposed actions, there would be no effect on harlequin ducks under any alternative.

Townsend's Big-eared Bat

Caves and cave-like structures are a critical habitat for this species, both as hibernacula in the winter and as roosts for summer nursery colonies. They occasionally use bridges and old buildings for roosting and in some places have been known to use building attics as nursery sites (Perkins, 1992 p. 9). In northern Idaho, Townsend's big-eared bats primarily roost in abandoned mines. Loss and disturbance of hibernacula and roosting habitat is the limiting factor for Townsend's big-eared bats.

There are no abandoned mines or caves in the wildlife analysis area that may serve as potential habitat. The species is not known or suspected in the project area. Based on the lack of suitable habitat and occurrence there would be no impact on habitat or the species.

Coeur d'Alene Salamander

Coeur d'Alene salamanders are restricted to cool damp aquatic habitats that have thermal and hydric stability. The species has been found in three major types of habitats between 1,800 to 3,500 feet elevation in northern Idaho: spring seeps, waterfall spray zones and along stream edges. Known populations occur in association with sharply fractured rock formations in conjunction with both persistent and intermittent surface water (Cassirer et.al., 1994). These conditions are critical for Coeur d'Alene salamanders since they respire through the skin and lose water to the environment through evaporation (Groves 1989).

There are no known salamander sites in the Emerald Creek Garnet Area wildlife analysis area. Limited potentially suitable microhabitat does occur in the analysis area. However, repeated surveys have failed to document the presence of Coeur d'Alene salamanders (USDA, 1993). Wilson (1992) cites the E.F. Emerald Creek and its tributaries from Hodo summit to Garnet Gulch as an area that may contain suitable habitat and suggests additional surveys. Subsequent data collection narrowed potential habitat to three sites in Highline Creek, Strom Gulch, and Flat Creek (USDA, 1993). Observations of the affected riparian areas during field reviews have not noted potential habitat. The East Fork Emerald Creek drainage has not been identified as critical to the long-term persistence of Coeur d'Alene salamanders (IDFG et. al., 1994).

In general, the geology of the wildlife analysis area (see the Minerals and Geology section) is not conducive to microhabitat for Coeur d'Alene salamanders (e.g. very little fractured rock associated with springs/seeps and stream sides). The occurrence of the garnet resource and potential salamander habitat has not been observed to coincide. Based on the lack of capable/suitable habitat and occurrence there would be no impact on habitat or the species.

Table 26 - Screening Process and Results for the Emerald Creek Garnet Area Project

Species/Habitat	Species or Habitat Present in St. Joe drainage?*	Species or Habitat Present in Analysis Area?	Further Analysis?	Rationale for no further analysis**
Listed - Threatened & Endangered				
Gray Wolf***	Y	Y/I	Y	
Woodland Caribou	N	N	N	1
Bald Eagle	Y	I	Y	
Grizzly Bear	N/I	N	N	1
Canada Lynx	Y	N	N	2
Sensitive				
American Peregrine Falcon	U/I	N	N	2
Black-backed Woodpecker	Y	Y	Y	
Black Swift	U	N	N	2
Common Loon	N	N	N	1
Flammulated Owl	Y	U/N	Y	
Harlequin Duck	Y	N	N	2
Pygmy Nuthatch	Y	U/N	Y	
Fisher	Y	Y	Y	
Fringed Myotis	U	U	Y	
North American Wolverine	Y	Y	Y	
Northern Bog Lemming	N	N	N	1
Northern Goshawk	Y	Y	Y	
Townsend's Big Eared Bat	U	U	N	2
Coeur d'Alene Salamander	Y	N	N	2
Western Toad	Y	Y	Y	
Management Indicator				
Elk	Y	Y	Y	
Moose	Y	Y	Y	
Marten	Y	Y	Y	
Pileated Woodpecker	Y	Y	Y	
Other				
Forest land birds	Y	Y/U	N	3
Cavity/Snag habitat	Y	Y	Y	

*Yes, No, Unknown, or Incidental (if at all).

**1 Rationale and documentation is provided in the project file (WL-3) for the determination that the species or habitat is not present within the St. Joe River drainage.

2 Rationale is provided later in this document and in the project file (WL-3) why there would not be any effect on habitat or the species.

3 Species does not apply or is not appropriate for the Project. Rationale is provided in the project file (WL-3) and/or later in this document.

***South of Interstate 90, gray wolves are classified as nonessential experimental populations; this classification treats wolves as proposed for listing under the ESA.

Forest Land Birds

Forest Land Birds include all the avian species sometimes collectively termed as 'Neotropical migrant birds' and 'resident songbirds'. This group of birds is an extremely diverse group of species, with divergent habitat associations and potential effects.

Various land birds are known to be present in the wildlife analysis area. Virtually any activity, including no action, may adversely and beneficially affect some species in this group.

Effects on this broad group of species would vary by species/guild and their habitat relationships. Some species would see an increase in capable and suitable habitat by the creation of open conditions. Other species would lose suitable habitat by a changes in forested riparian habitat.

Species likely to be affected by activities are represented by other habitat elements and species addressed in this screen and/or analyzed further. Elements and species analyzed include: forest structure, riparian habitat, general forest species (elk), dry site species (flammulated owl), old growth species (flammulated owl, fisher, pileated woodpecker and northern goshawk), and snag dependent species (pileated and black-backed woodpeckers). Priority Avian Habitats from the Idaho Partners in Flight *Idaho Bird Conservation Plan* (Idaho Partners in Flight, 2000) are included in the analysis.

Forest land birds are being addressed at a state and regional level, which is the level most appropriate. No further analysis specifically for this group of species will be conducted.

Issue Indicators

Indicators and units of measurement for habitat and species based on habitat relationships and the scope of the proposed actions are displayed in Table 23.

The indicators and measurements (esp. for species) identified in the table are evaluated within the context of potential effects on the survival of individuals and persistence of populations (Ruggiero et al. 1994). The analyses of effects on species - if needed - are tiered to the analyses of effects on the types/components of habitat displayed in the table.

Wildlife Habitat

This section of the analysis uses a medium/coarse filter level of analysis to display existing conditions and effects at the scale of the wildlife analysis area. This provides a perspective for later analysis of individual species and helps determine the level of analysis needed to address concerns.

Forest Structure

Forest vegetative communities at various successional stages provide habitat attributes for wildlife species. For example, some wildlife species are associated with dead and downed logs and late successional stages; others are associated with a combination of early and late successional stages.

The St. Joe Geographic Assessment and the *Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (CRB Assessment) (Quigley et. al. 1996) revealed - at their respective scales - that there has been a decrease in late-seral habitat from historic levels. Many wildlife species addressed in this analysis are associated with this type of habitat. Therefore, one of the parameters regarding potential impacts on wildlife and the proposed action and alternatives is the impact on the amount of late seral and old growth stands.

In this section and throughout the wildlife analysis direct effect acres include the area impacted by the activities (e.g. acres of road clearing, acres of forested mining panels, etc.); indirect effect acres include the length of area adjacent to the direct effects area.

Existing Condition

Past actions and events (e.g. historic logging and fires) in the early part of the 20th century (WL-7) have helped shape the existing condition in the analysis area (e.g. the amount and distribution of various size classes). More recent past harvest activities on NFS and non-NFS lands have also affected the quantity, quality, and distribution of habitat (e.g. an increase in sapling/seedling stands with a corresponding reduction in immature sawtimber and/or sawtimber). In addition mining and grazing have created/maintained some current open/non-stocked stands (e.g. grass meadows).

On NFS lands in the analysis area 74 stands (or portions of stands) totaling approximately 1,959 acres have received some type of harvest treatment since 1967 (the earliest activity in the database). These treatments have resulted in a change in size class (e.g. to existing seedling or sapling dependent on when harvested) on 1,421 acres. On 538 acres the treatment did not change the size class of the remaining stand but did reduce such attributes as canopy closure, trees per acre, and basal area. Past activities (historic and recent) have resulted in the existing condition on NFS lands displayed in the following table.

Table 27 - Size Class Existing Condition on National Forest System Lands

Size Class*	Total Acres	% of Total Acres**	% of NFS Acres**
Sawtimber	1,141	16%	18%
(no treatment)	(1,062)	(15%)	(>16%)
(intermediate treatment)	(79)	(1%)	(<2%)
Immature sawtimber	3,622	52%	56%
(no treatment)	(3,163)	(46%)	(49%)
(intermediate treatment)	(459)	(<7%)	(7%)
Multistory	177	3%	3%
Pole	39	<1%	<1%
Sapling	1,161	17%	18%
Seedling	148	2%	2%
Open/Non stocked***	198	3%	3%
NFS no data	19	<1%	<1%
Private land	444	6%	na

* *see the project file (WL-8) for a description of the various size classes*
** *percentages are rounded and may not total 100%*
*** *includes stands recently harvested and planted or scheduled for planting but not yet updated in TSMRS*

While the following information on historic and current vegetation structure for the St. Joe Area is not directly comparable with information in the analysis area it nonetheless provides context for both the existing condition and the evaluation of potential effects.

Table 28 – Historic vs Current Vegetation Structure for the St. Joe Area

	Shrub/ Seed/Sapling	Pole	Medium/ Immature	Large/ Mature	Old Growth
Historic	20.5%	15.3%	20.3%	23.7%	20.2%
Current (c. 2002)	19.4%	4.7%	44.7%	20.0%	11.2%

Table 29 - Indicators and Measurement of Effects for Wildlife

Forest Structure	Amount and distribution of forest structural stages	Change in acres and percent of size classes.
Riparian Habitat	Changes in riparian vegetation and condition	Area of riparian habitat impacted
Connectivity	Changes in cover in travel routes & impediments to movement	Changes in acres of forest structure along ridges and riparian areas
Access	Changes in human access	Road density*
Disturbance	Changes in the amount of security and human activity levels	Acres of security and location and duration of activities
Cavity Habitat	Availability of potential habitat	Changes in acres and % of immature and older forest structure
Gray Wolf	Changes in access, potential for conflicts & prey availability	Road density*, human use and potential elk use (aka EHP)
Bald Eagle	Changes in forest structure adjacent to large bodies of water and disturbance	Changes in acres of forest structure and changes in disturbance levels near large bodies of water
Black-backed Woodpecker	Changes in suitable habitat**	Acres of suitable habitat
Flammulated Owl	Changes in suitable habitat**	Acres of suitable habitat
Pygmy Nuthatch	Changes in suitable habitat**	Acres of suitable habitat
Fisher	Changes in suitable habitat**, security, and travel opportunities	Acres suitable habitat, road density*, & length of riparian habitat impacted
Fringed Myotis	Changes in suitable habitat**, loss and disturbance of potential roost sites	Acres of suitable habitat, impacts to riparian vegetation and impacts to potential roost sites
Northern Goshawk	Changes in suitable habitat** and disturbance of denning habitat	Acres of suitable habitat and location and duration of activities relative to denning habitat
Wolverine	Disturbance of denning habitat and security	Activity near potential denning habitat and road density*
Western Toad	Impacts on potential breeding habitat and potential for direct mortality	Impacts to riparian habitat & risk of mortality
Elk	Changes in road effects and vulnerability	Road densities*, acres of security and EHP
Moose	Changes in access and availability of wetland browse	Road densities* and impacts to riparian/wetland habitat
Marten	Changes in suitable habitat**, security, and travel opportunities	Acres of suitable habitat, road density*, and length of riparian habitat impacted
Pileated Woodpecker	Changes in suitable habitat**	Acres of suitable habitat by home range

** Road density includes total road density (both restricted and open roads) and open road density*
*** Suitable habitat for each species is discussed in their respective sections*

A number of species relevant to the analysis are associated with old growth (and late seral) habitat. The IPNF Forest Plan established standards for old growth habitat management to help provide for a diversity of plant and animal communities, habitats and species. The amount of old growth (on NFS land) in the analysis area is summarized in the following table and provides a coarse/medium filter assessment. The old growth acres include sawtimber, immature sawtimber and multistoried stands. The following old growth data does not represent all suitable habitat for "old growth associated" species and is not the only measure of existing conditions (nor potential effects) for wildlife species.

Table 30 – Old Growth on NFS Lands in the Wildlife Analysis Area

Old Growth*	Acres	%
Allocated	902	14%
Code 9 - field data	719	11%
Code 10 - photo interp	0	
Code 11 - potential	183	3%
Additional		
Code 13 – photo interp	22	<1%
Block sizes	15-398	

** A further description of the old growth codes is in the project file (WL-5).*

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

There would be no direct or indirect effect on old growth and no change in the acres of allocated old growth.

Cumulative Effects

The following table depicts the current and/or reasonably foreseeable actions – and existing size class - that would impact forest structure in the wildlife analysis area. These actions are at different stages in planning or implementation.

There would be no direct effect on allocated old growth in any alternative. Harvest units from planned Forest Service timber sales are adjacent to allocated old growth. However, the type of treatment (i.e. thinning), existing condition (i.e. burned), and/or unit layout (e.g. riparian buffers) considerably reduces or eliminates indirect effects from those projects on the existing allocated old growth stands (and other adjacent habitat).

Table 31 - Reasonably Foreseeable Activities Common to All Alternatives

Activity	NFS		Non-NFS	
	Acres	Size class	Acres	Size class
Emerald City Timber Sale	58	IMSA		
Scarecrow Timber Sale	1	IMSA		
Emerald Butte Access	1	IMSA		
Public Garnet Collecting	5	IMSA		
Private Timber Harvest			444	IMSA*
Totals	65	+	444	= 509

* Based on aerial photos (current and c. 1930), field ocular observation, and extrapolation from data on NFS lands, these acres are predominately (if not entirely) IMSA.

Some harvest on non-NFS lands would occur adjacent to old growth. This activity would have an indirect effect on ≈ 5,800 feet of old growth on NFS lands (WL-10). There would also be indirect effects from harvest

(both on NFS and non-NFS) on other than old growth stands. These indirect effects on adjacent stands would be similar in many ways to effects from historic disturbance (e.g. fires, blow down). However, there are also aspects of these indirect effects that would not be similar (e.g. straight lines, fewer standing snags, and less down wood). Based on the scope of the analysis area and the proposed actions(s) the consequences of these indirect effects and adjacent stands are negligible and would not appreciably affect wildlife habitat or species.

The Scarecrow Timber Sale would impact approximately one acre of fire killed immature sawtimber habitat on NFS lands.

The Emerald City Timber Sale would treat approximately 58 acres of immature sawtimber size class (40 acres of Douglas-fir forest type and 18 acres of grand fir forest type) in the analysis area. The treatment would not change the size class designation of the stands but would affect other attributes of the stands such as decrease the canopy cover, reduce the tree density, and reduce the vertical diversity in the stand. The conditions following treatment would provide forage (at a reduce value from existing conditions) for fisher, marten and goshawk. The harvest would impact <2% of the existing immature size class in the analysis area.

On-going and anticipated activities on private timber company land will treat most if not all non-NFS lands in the analysis area.

Alternative A

Direct & Indirect Effects

This alternative would have a negligible effect on wildlife. Public collecting of the accessible garnet gemstone in 281 Gulch would remove approximately four acres of immature sawtimber forest structure which represents <0.1 % of that structure in the analysis area. There would also be indirect effects adjacent to approximately 900 feet of immature sawtimber size forest structure associated with the vegetation removal. This would not change the size class in the affected stands but would impact the understory – e.g. from increased light. Because the existing condition of riparian habitat is open the indirect effects amount essentially to a shift in the location of the edge between open and forested structure.

Cumulative Effects

The direct and indirect effects from activities in 281 Gulch would be added to the cumulative effects documented under those common to all alternatives. These additional effects would have minimal impact on the availability of wildlife habitat.

Alternative B & C

Direct & Indirect Effects

Planned recreational garnet removal would remove all trees on approximately four acres of existing immature sawtimber size class in 281 Gulch and approximately 8.5 to 10.5 acres of existing immature sawtimber size class in Garnet Gulch. This is at most ≈ 0.4% of the existing acres of that size class in the analysis area. While the cutting of trees or small groups of trees does entail a risk of adverse effects for some species (e.g. cavity nesting species) by disturbing individuals and/or direct loss of habitat, this risk is relatively small and inconsequential given the extent of acres affected relative to suitable habitat available.

Indirect effects would occur adjacent to ≈ 2,600 feet of immature size class. This would not change the size class in the affected stands but would impact the understory – e.g. from increased light. This would shift the existing edge and have minimal impact on the availability of wildlife habitat.

Cumulative Effects

The direct and indirect effects from activities in Garnet Gulch would be added to the cumulative effects documented under those in Alternative A. These additional effects would have minimal impact on the availability of wildlife habitat.

Riparian Habitat

Riparian areas provide potential habitat for a number of wildlife species including western toads and bald eagles. Riparian areas also are used as travel routes by species such as fisher/marten and provide special habitat components such as wallows for elk.

Mining activities in riparian areas can alter the suitability and capability of habitat. The effects on habitat and the consequences for wildlife vary dependent on the existing condition and the degree of impact. For example, effects from mining in riparian areas with existing standing water would be different from effects in riparian areas with only fast moving water. The area under mining operations at any given time and the conditions following reclamation also influence the potential effects on habitat and species on a temporal scale.

The analysis area for riparian habitat is the project area, which includes portions of 281 Gulch, Garnet Gulch, No Name Gulch, Pee Wee Gulch, and the E Fork Emerald Creek (See Appendix H: Map 2). The impacts to riparian habitat are measured in linear length, acres, and/or the area of direct impact per unit of time. For the purposes of this analysis, the length of mapped streams and tributaries in the project area is used to assess effects. There is a total of approximately 39,350 linear feet of stream/riparian habitat in the project area.

Existing Condition

There are no large (i.e. > one acre) bodies of water in the project area. There is a range in the existing condition of riparian habitat in the analysis area, due to both natural and human causes. Some riparian areas are flat and relatively wide (>150 feet) others are narrow and - at other than a very fine resolution - are virtually indistinguishable from adjacent upland habitat (except for the width of the stream channel itself). Vegetative conditions range from open to forested. Open areas include areas impacted by human activities (e.g. mining, roads, and livestock grazing) and apparently natural openings of grasses/sedges, forbs and shrubs as a result of fire, beavers, and other factors.

Field review, aerial photos and historic information reveal that riparian vegetation in the analysis area and project area has been impacted by human activities such as past/present mining, recreational mining rehabilitation, historic timber harvest (e.g. prior to 1960s), roads, old and existing railroads, recreation, and livestock grazing. Some past impacts and their effects are obvious (e.g. existing roads, recent mining). Evidence of other past impacts is less apparent, and the effects have or appear to have been lessened by time (e.g. old roads, old timber harvest). Due to such things as undocumented/unregulated past garnet extraction, it is not possible to measure the exact extent of past impacts on riparian habitat. However, based on aerial photos and survey information it is estimated that ≈ 13,510 ft. of riparian habitat in the project area has been impacted to some degree by past and present activities.

The riparian areas that would be mined under this proposal are mostly open areas with grasses/sedges, forbs, and/or shrubs comprising the predominate vegetation. If present, trees (live and dead) are scattered at very low densities. However, some riparian areas proposed for mining do have more standing live trees with grasses/sedges, forbs and shrubs in the understory. In addition to the stream channel itself these areas contain small persistent and ephemeral standing/slow moving water in the flat riparian zone. These small water areas range in size from a couple of square feet to old beaver ponds that cover approximately ½ acre. These areas of standing water provide potential breeding habitat for amphibians including western toads.

The existing parking areas in the E.F. Emerald Creek riparian area - near 281 Gulch and Pee Wee Gulch - are providing little of the habitat commonly associated with riparian areas (e.g. riparian vegetation, persistent water, etc.).

Environmental Consequences

Alternative A

Direct & Indirect Effects

Approximately one acre (600 ft.) of riparian habitat would be mined in 281 Gulch. The existing condition of the riparian area proposed for mining is predominately comprised of grasses, sedges, forbs, and brush with few trees. During the time that a riparian panel is being actively mined there would virtually be a complete loss of habitat in that panel. Design features of the proposed action would limit the extent of riparian habitat being mined in any given year to approximately 150 ft. (≈ 10,500 $ft^{2)}$. The excavated area would be reclaimed directly following removal of garnet bearing gravels. This reclamation would restore the affected area to some semblance of "natural" with in the same season. However, complete restoration of habitat would likely take a number of years and may never return to a "natural" state.

Restoration of approximately 3,380 feet of riparian area from past operations in the East Fork and West Fork of 281 Gulch would be completed. Large, woody debris would be strategically placed in the stream along an estimated 1,000 feet of both Pee Wee and No Name Gulch to enhance aquatic habitat. Restoration plans include provisions to maintain or improve (to the extent practicable) riparian habitat. The existing parking areas in the floodplain of the E. F. Emerald Creek (near 281 Gulch and Pee Wee Gulch) would be partially removed (leaving turnouts). This would restore ≈ 1.5 acres of riparian area to more natural conditions.

Cumulative Effects

This alternative would mine and then restore riparian conditions on the one acre proposed for mining, restore approximately 1.5 acres of existing parking area in the E.F. Emerald riparian area, and restore riparian conditions on an additional ≈ 3,380 feet of riparian habitat impacted by past activities in 281 Gulch. Approximately 1,000 feet in both Pee Wee and No Name Gulches would also be restored. Existing conditions would remain the same on the majority of riparian habitat in the analysis area and natural processes would continue to exert changes in all riparian habitat.

Alternative B & C

Direct & Indirect Effects

The proposed recreational garnet mining would impact approximately one additional acre of riparian habitat in 281 Gulch and approximately 2.2 acres of riparian habitat in Garnet Gulch. The existing conditions of the riparian areas proposed for mining are predominately comprised of grasses, sedges, forbs, and brush with few trees. During the time that a riparian panel is being actively mined there would virtually be a complete loss of habitat in that panel. Design features of the proposed action would limit the extent of riparian habitat being mined at any given time to not more than about 150 linear ft. (≈ 10,500 $ft^{2)}$. The excavated panels would be reclaimed directly following removal of garnet bearing gravels. This reclamation would restore the affected area to some semblance of "natural" with in the same season. However, complete restoration of habitat would likely take a number of years and may never return to a "natural" state.

Restoration of approximately 3,380 feet of riparian area from past operations in 281 Gulch would be completed. Large, woody debris will be strategically placed in the stream along an estimated 1,000 feet of both Pee Wee and No Name Gulch to enhance aquatic habitat. Restoration plans include provisions to maintain or improve (to the extent practicable) riparian habitat. A portion of the existing parking area in the floodplain of the East Fork Emerald Creek near Pee Wee Gulch would be partially removed (leaving turnouts). This would restore ≈ 0.5 acre of riparian area to more natural conditions.

Cumulative Effects

These alternatives would mine and then restore riparian conditions on the 3.2 acres proposed for mining and restore riparian conditions on an additional ≈ 5,380 feet of riparian habitat impacted by past activities. Existing conditions would remain the same on the majority of riparian habitat in the analysis area and natural processes would continue to exert changes in all riparian habitat.

Connectivity

The spatial arrangement of existing forest structure, land uses (e.g. mining), and roads can affect movement of wildlife. Changes in cover that may create a filter or barrier to travel/movement in the wildlife analysis area are assessed and discussed in context with the existing condition and potential travel opportunities in the analysis area. The potential effects on wildlife movement due to human activities associated with mining and roads are addressed in the Access/Disturbance section.

Existing Condition

The effects on connectivity from historic past events/actions (i.e. fires and logging c.1930s that created openings) have largely diminished. More recent (since 1960s) past harvest on both NFS and non-NFS land and road construction (e.g. Road 1487) are affecting connectivity/travel to varying degrees dependent on the species.

Ridges with more gentle slopes that provide potential corridors and connectivity have been delineated on a map (WL-6) as have streams (i.e. riparian areas for travel/movement). These are not the only avenues for movement but are recognized as areas used by a number of wildlife species for travel/movement (e.g. Leege, 1984 and Joslin and Youmans, 1999). Areas along these ridges that may create an impediment to travel for some species have also been identified and mapped (WL-6). Most riparian areas in the analysis area are providing relatively unaltered potential travel opportunities for most wildlife species. However portions the riparian areas in sections of the East Fork Emerald Creek, No Name Gulch, Garnet Gulch, West Fork 281 Gulch and an un-named drainage to the east of 281 Gulch are open with possible minor impacts on connectivity for some species. A number of ridges have had trees removed across their entire width creating temporary filters and/or barriers to travel by some wildlife. In some areas this has merely caused minor alterations in use and in other areas has most likely resulted in a substantial alteration in use. However, on the whole, existing vegetation conditions provide ample opportunities for wildlife to travel in and through the analysis area.

Environmental Consequences

Alternative A

Direct & Indirect Effects

Excavation to remove accessible garnets in 281 Gulch would require removal of immature sawtimber forest structure in and adjacent to the riparian area on approximately four acres. Approximately 600 feet or riparian area and 900 feet of non-riparian habitat would be affected. There would be no direct or indirect adverse effects on connectivity along ridges or saddles. Beneficial effects from restoration of past Forest Service garnet mining operations would occur on ≈ 5,380 feet. However the majority of the benefit – related to connectivity - would occur later in time (as riparian vegetation matures and provides cover). The decommissioning of Road 3781 would have only minor benefits to connectivity due to its mid-slope location.

Cumulative Effects

While connectivity has been and may be further affected there would remain ample opportunities for movement of wildlife along ridges and streams. The following effects would be in addition to those described under Existing Conditions and Direct & Indirect Effects.

Ongoing and planned timber harvest activity on non-NFS land in the analysis area has/would affect ≈ 4,125 ft of forest on the East Fork Emerald Creek and West Fork Emerald Creek divide and another ≈ 900 ft on a side ridge. This activity may result in alteration of connectivity along the divide.

The Emerald City harvest unit on NFS land in the analysis area would thin an immature sawtimber stand across one of the ridges identified as a potential connection. However, based on the type of treatment (i.e. thinning) and the availability of adjacent untreated stands with sufficient cover this would not have an appreciable effect on connectivity. There are untreated stands in the analysis area that would provide alternate opportunities for movement of wildlife species in and through the analysis area.

Alternative B & C

Direct & Indirect Effects

In addition to the direct and indirect effects associated with Alternative A, these alternatives would affect ≈ 8.5 – 10.5 acres (in Alternative B & C respectively) in Garnet Gulch. Approximately 1,700 feet of riparian habitat and 1,700 feet of upland forest structure adjacent to the riparian area would be affected. The greatest combined width would be ≈ 280 ft. This would alter travel opportunities for some wildlife species in the riparian area. The construction of the access road in Garnet Gulch would disrupt connectivity on the ridge between Garnet and 281 Gulches. However the midslope on the 281 side of the ridge would provide for movement of wildlife species. Beneficial effects from restoration of past F.S. garnet mining operations would occur on ≈ 5,380 feet. However the majority of the benefit – related to connectivity - would occur later in time (as riparian vegetation matures and provides cover).

Cumulative Effects

While connectivity has been and may be further affected there would remain ample opportunities for movement of wildlife along ridges and streams. The direct and indirect effects associated with these alternatives would be added to the cumulative effects describe under Alternative A. There are untreated stands in the analysis area that would provide alternate opportunities for movement of wildlife species in and through the analysis area.

Access/Disturbance

Many wildlife species are sensitive to human disturbance and/or adversely impacted by human access. Potential temporary disturbance of wildlife is inherent in most human activity and may include alteration of normal use patterns and potential relocation to avoid disturbance (e.g. using alternate forage areas). This type of disturbance is not based on loss or long-term alteration of habitat. Because of its usually limited implications and constant background disturbance (e.g. use of open roads) in most situations this would not appreciably affect suitability of habitat or populations. However, given the duration of the proposed action(s), the potential for long-term disturbance is assessed. Based on the nature/scope of the proposal the analysis for disturbance focuses on the project area.

Access levels and roads can adversely impact wildlife. Effects on wildlife can be caused by roads themselves and by the increased contact with humans that they afford. High levels of open roads (or roads and trails used by motorized vehicles) can affect wildlife species by displacing them from preferred habitats for one or more seasons and/or increasing their vulnerability to mortality. The CRB Assessment identified that those species vulnerable to human disturbance have relatively low amounts of secure habitat. The St. Joe Geographic Assessment also identified security as a concern.

Existing Condition

Access – Approximately 1,795 feet of road (Road 3781) are associated directly with the Forest Service garnet removal in 281 Gulch. The road goes from Road 447 to the collection site and is used to provide administrative access and access for people with disabilities. The project area is bordered on the south by Road 447 which is open to all uses and on the north by Road 1487 which is restricted to administrative use or motorized vehicles less than 50 inches wide.

Disturbance - Although it is difficult to quantify, disturbance is associated primarily with roads (including roads restricted to full-size vehicles but open to other motorized vehicles) and their juxtaposition on the landscape. Existing disturbance in the wildlife analysis area comes from the following sources:

- Current and Closed Timber Sales - on NFS and non-NFS lands – using Road 1487 for access
- Current recreational mining activity (281 Gulch)
- Grazing allotment activity
- General Forest use (e.g. recreating, hunting, camping, firewood gathering, etc.)

- ATV use of restricted roads
- Other uses (e.g. fire suppression and administrative use)

Environmental Consequences

Alternative A

Direct & Indirect Effects

Public garnet collecting in 281 Gulch would maintain the current level of disturbance and use on Road 3781 until recreational garnet removal is concluded. The decommissioning of Road 3781 following cessation of mining would remove ≈ 1,795 feet of road that receives only restricted and seasonal use (Memorial Day through Labor Day).

Cumulative Effects

Current road management (e.g. open Road 447 and restricted Road 1487) would continue a level of disturbance near existing levels affecting the project area and surrounding landscape. However, when present and reasonably foreseeable timber harvest operations on NFS and non-NFS lands are finished (4-5 years) and the current garnet mining operation in 281 Gulch is done (including the removal of Road 3781), the disturbance level in the area would decline from current levels.

Alternative B & C

Direct & Indirect Effects

These alternatives would continue the current disturbance (at similar levels) in 281 Gulch until the operation is moved to Garnet Gulch. Approximately 1,795 feet of road would be decommissioned in 281 Gulch and ≈3,600 feet of new road would be constructed in Garnet Gulch. This has minimal effects on access and essentially moves the existing disturbance to a different drainage. Although Alternative C would have more traffic on the new road providing access to the mining operation, there would be little difference in effects on wildlife. This is based on the limited season of use (e.g. outside of hunting season) and the presence of human activities associated with mining in each alternative.

Cumulative Effects

The cumulative effects for these alternatives are the same as described under Alternative A.

Cavity Habitat

The amount of snags and down woody material present has been identified as a measure of forestland integrity (Quigley et. al. 1996). Snags of varying size, condition, and tree species provide habitat for a variety of wildlife species. The species totally or largely dependent on cavity habitat include some sensitive (e.g. black-backed woodpecker, flammulated owl) and management indicator species (e.g. pileated woodpecker).

Existing cavity habitat is a function of past and present disturbances (e.g. fire, insects, disease, and timber harvest), stand initiation, and succession. Cavity habitat for this analysis is measured by assessing the change in the acres of unmanaged immature sawtimber and sawtimber size classes in the wildlife analysis area. These are the stands that contain relatively higher densities of large snags and trees (Wisdom et al. 2000).

Existing Condition

Table 32 – Managed vs. Unmanaged Sawtimber and Immature Sawtimber

Sawtimber/Mature Sawtimber	1,141	18%	16%
unmanaged	1,062	>16%	15%
managed	79	<2%	1%
Immature Sawtimber	3,622	56%	52%
unmanaged	3,163	49%	46%
managed	459	7%	<7%

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

As documented in the Forest Structure portion of the Wildlife section there would be no effects on old growth and negligible effects on sawtimber and immature sawtimber size classes. The potential effects on cavity habitat would similarly be negligible.

Cumulative Effects

As documented in the Forest Structure portion of the Wildlife section there would be a loss of cavity habitat on ≈509 acres from present and reasonably foreseeable activities. However, the following factors would minimize the impact on cavity habitat on NFS land and contribute to those activities meeting Forest Plan and Region 1 snag retention guidelines.

- Design features of the projects include maintaining all snags not considered a safety hazard and/or retaining all snags in buffers/untreated areas.
- The projects treat a very small percentage (<2%) of existing immature sawtimber size class stands on NFS lands and retains 64% of the NFS lands (60% of all ownership) in the combined analysis areas in unmanaged immature sawtimber or sawtimber.

On NFS land existing cavity habitat potential would be maintained on all existing 1,062 acres of unmanaged sawtimber size class stands and on a minimum of 3,086 acres of unmanaged immature sawtimber size class stands. This represents 64% of NFS land and is within the range of historic variation on the St. Joe Drainage (see Table 24 in Forest Structure portion).

Management Indicator Species

Management Indicator Species (MIS) are species selected to estimate the effects of management activities on wildlife populations. The Forest Plan identified the MIS for the Forests. They include several categories of species including: threatened, endangered and sensitive, commonly hunted or trapped, and species whose population changes are believed to indicate effects of management on other species or biological communities. In this analysis TE&S species have been addressed separately. The two other categories are addressed in this section. Those species from the IPNF Forest Plan that are applicable to the St. Joe District and project area are displayed and briefly discussed in Table 28.

Table 33 - Wildlife MIS for the St. Joe District

Species	Remarks	Existing Habitat
Marten	Trapped, associated with late successional mesic conifer forest habitat.	Habitat exists; analysis is documented in section with fisher.
Pileated Woodpecker	Primary cavity excavator, dependent on large snags, associated with late successional habitat.	Habitat and species present, further analysis will be completed.
Elk	Hunted, important big game species, affected by human disturbance and human use of roads.	Habitat and species present, public issue, further analysis will be completed.
Moose	Hunted, relatively unique big game species, occurs in low numbers throughout the IPNF.	Habitat and species present, elk analysis meets most analysis needs. Further analysis tied to riparian/wetland habitat will be completed.

Pileated Woodpecker (Old Growth Associated MIS)

The pileated woodpecker is an old growth indicator in the Forest Plan because of its strong tie to the availability of large snags. The pileated woodpecker also uses young and fragmented forests with abundant remnant old structure (Samson, 2005). Pileated woodpeckers require tall, large-diameter dead or live defective trees within forested stands for nesting (Warren, 1990). Nest trees average nearly 30 inches, the minimum nest tree diameter is 20 inches. Carpenter ants make up the bulk of their diet. Feeding habitat includes large snags with advanced decay, the moist decaying butts of live trees, logs greater than 10 inches diameter, and natural or cut stumps. Large trees, canopy cover and the number and size of feeding sites (e.g. dead trees greater than 10 inches diameter) are all important features of quality pileated habitat (Aney and McClelland 1990, B. McClelland, 1993). Activities that reduce these habitat features may affect pileated habitat suitability.

Methodology and Geographic Scope

The analysis of effects on pileated woodpeckers is based on direction in *Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains* (Warren, 1990). The analysis is also tiered to the analysis done for forest structure and cavity habitat. The geographic scope for direct, indirect, and cumulative effects is the wildlife analysis area.

TSMRS/FSVeg data were used to identify potentially suitable habitat and assess the potential for effects. The analysis methodology for determining the existing condition and potential effects on pileated woodpeckers involved mapping old growth and mature forest stands of suitable forest types (i.e. potentially suitable nesting habitat) and delineating hypothetical 1,000-acre home ranges around suitable nesting stands/groups of stands.

Areas with at least 100 acres of contiguous mature sawtimber or old growth habitat and an additional contiguous 100 acres of mature and/or immature sawtimber were identified as having sufficient suitable nesting habitat. This is based on relative habitat values and the acres of suitable nesting habitat a home range should have (USDA, 1990).

Once home ranges with suitable nest stands were identified, the suitability of surrounding stands in the home range to provide adequate feeding habitat was evaluated. Within each home range at least 500 acres of mature/old forest and/or immature/large tree habitat is needed to provide adequate feeding habitat. Impacts on suitable habitat was then determined for each home range and was compared by alternative.

Existing Condition

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

There would be minimal if any impact on the existing or future suitability of pileated woodpecker habitat. There would be no direct or indirect effect on old growth, and there would no change in the acres of allocated old growth. There would be no direct or indirect effect on mature/sawtimber size forest structure. The effects on forest structure are minimal (see the effects on Forest Structure). There would be no activity in any of the three identified potential home ranges and negligible effects on the availability of suitable habitat for pileated woodpeckers.

Public garnet collecting would remove ≈ 3 – 10.5 acres of immature sawtimber forest structure which represents at most ≈ 0.4 % of that structure in the analysis area. Indirect effects on immature sawtimber size forest structure associated with the vegetation removal would have negligible effects on pileated woodpecker habitat attributes (e.g. number of large defective trees).

Cumulative Effects

There would be no effect on the ability of the analysis area to support pileated woodpeckers, and there is no change in species presence anticipated. Based on the limited direct and indirect effects on vegetation/habitat (see the Forest Structure section) and the existing condition, there would be no substantial addition to exiting effects from past, present and reasonably foreseeable actions. The analysis areas would each maintain a sufficient amount and distribution of suitable pileated habitat (e.g. three suitable home ranges).

There would be no cumulative effects associated with this project or analysis area that would jeopardize populations of pileated woodpeckers. This is based on the limited effects from this project, the maintenance of suitable habitat and home ranges in the analysis area, and habitat estimates across Region 1 and the IPNF that show habitat is abundant (Samson, 2005).

Elk

Elk are an important big game species on the St. Joe District and within the analysis area. Elk were identified in the Forest Plan as general forest seral species easily affected by management activities. Land management activities, particularly timber harvest and associated roads, affect elk habitat quality, potential elk use of habitat, and elk mortality from hunting.

Methodology

The most important factor usually regulating use of habitat by elk is disturbance by people. Most disturbance (and hunting mortality) is related to roads (Leege, 1984). The commonly used analysis methodology from the *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* (Leege, 1984) evaluates various factors affecting elk habitat quality and assigns a numerical rating. Factors evaluated include: roads, security acres, cover, forage, and livestock. This rating is used to determine elk habitat quality (expressed

as a percent of potential elk use or elk Habitat Potential - EHP). However, based on the proposed action(s) and the analysis of potential effects on vegetation and access, there would be no measurable change in elk habitat due to road effects, security acres, cover or forage. This is primarily due to the existing and proposed use on roads associated with the proposal (e.g. restricted use, use outside of hunting season, and minimal change in road miles). The proposed action(s) do not propose changes in livestock grazing levels. There would be no meaningful change in any of the factors affecting elk habitat quality. Using the methodology in *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* would not provide any information helpful in analyzing/comparing the potential effects or useful for making a decision. Therefore, this methodology is used only to display conditions based on existing information (i.e. Emerald Resource Unit EIS).

The potential for impacts on elk is from changes in the level and location of disturbance associated with the proposed actions (e.g. the operation of heavy equipment and changes in traffic levels on existing open roads). The effects on elk will be measured by the changes in the location of disturbance by drainage/subdrainage and by the changes in traffic levels. The analysis is tiered to the analysis for disturbance and security.

Geographic Scope

The analysis area for direct and indirect effects on big game is the Emerald Creek Garnet Area wildlife analysis area. Cumulative effects were considered in adjacent areas (e.g. portions of the West Fork of Emerald Creek)

Existing Condition

Based on the analysis done for the Emerald Resource Unit EIS, the existing EHP in that area was projected to be approximately .46 following completion of all activities. Timber harvest in the sales that resulted from the Emerald Resource Unit EIS (1993) has been completed. Post sale activity - such as planting and sale area improvement projects - have not been entirely completed. Present access for harvest activity on non-NFS have extended the time when the EHP analyzed in the Emerald Resource Unit EIS will be met. However, design features of the access request (e.g. restricting use on spur roads not needed for non-NFS harvest and timing restrictions) have limited adverse impacts on big game habitat; and, those effects have been assessed in the appropriate NEPA document.

Disturbance from Forest Service administered recreational mining occurs in 281 Gulch. This disturbance is limited in nature and scope due to the fact that motorized access is restricted beyond existing open roads and occurs outside of hunting season when security and vulnerability are of most importance.

Existing commercial mining is currently occurring in the West Fork of Emerald Creek, which is to the north of the wildlife analysis area.

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

There would be minimal effects on elk. In Alternative A road miles would be reduced by .34 miles (1,795 feet) in the project area and wildlife analysis area. The difference between road decommissioning in 281 Gulch (1,795 feet) and road construction in Garnet Gulch (3,600 feet) in Alternatives B & C results in an increase of .34 miles (1,805 feet) of road in the project area and wildlife analysis area. This change in restricted road miles with seasonal use would have negligible effect on security or potential elk use in the wildlife analysis area. Furthermore, because of road location/alignment there is little change in the area affected by the new road in Garnet Gulch compared to the existing road in 281 Gulch. The movement of disturbance from 281 Gulch to Garnet Gulch would also have no measurable effect on elk.

The proposed mining would seasonally disturb elk (and moose) in the vicinity of the activity. It is anticipated that big game in the area would simply make greater use of adjacent drainages. Any direct and indirect

effects on big game (e.g. moose and elk) would be minor and seasonal. The potential displacement of big game or change in elk use would be negligible, inconsequential, and would not appreciably affect populations.

Cumulative Effects

Cumulative effects from access, disturbance, or the small changes in vegetation would not significantly impact potential elk use in the area. On-going and reasonably foreseeable activities on private land (e.g. road construction and subsequent harvest) would occur in the area. These activities – especially road use - could/would occur simultaneously in time and space with public recreational mining and other Forest Service activities. However, the effect from these overlapping activities would have little more impact than if they were to occur separately. Continued use of existing roads would delay the implementation of planned road restrictions and extend the duration of effects on wildlife associated with road use (primarily big game and especially elk). Design features (e.g. timing restrictions and gate closure requirements) of the Forest Service actions – including road use permits - would help minimize the cumulative effects associated with this project and other planned actions.

Moose

Moose were identified in the Forest Plan as a MIS associated with mature timber stands. Moose eat a variety of plants with shrubs and trees being the most important winter forage. Components of moose habitat include mature timber for cover, new growth of trees/shrubs for browse, and wetland areas that provide aquatic plants for browse. The level of human disturbance (i.e. human caused mortality) is also one of the habitat component affecting moose in the analysis area.

The analysis for forest structure and old growth shows no significant change in mature timber and upland browse. The analysis for access shows no change in open roads. Therefore, potential impacts on riparian habitat is used to measure potential effects on moose.

Existing Condition

The suitability of riparian habitat for moose in the analysis area is being adversely affected by existing open roads and the vegetative conditions. For example, the East Fork of Emerald Creek has an open road in or adjacent to the riparian area for most of its length, and the riparian area is relatively open with little forest structure or brush present. This present vegetative condition is a result of the old railroad, past mining, past harvest of trees (e.g. old stumps present) and beaver activity. Moose are known to use the wetlands created during the rehabilitation of past mining activity sites (e.g. near Emerald Creek Campground).

The riparian habitat in the drainages proposed for mining (i.e. 281 Gulch and Garnet Gulch) provides habitat for moose on a relatively limited scale. It does not provide areas of brush for browse or any extraordinary value for moose. See the section on Riparian habitat for additional discussion.

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

Based on the existing condition – i.e. limited habitat for moose – the small geographic scope and limited effects on vegetation, access, and riparian habitat there would be minimal impacts on moose from any alternative. The proposed activity would change conditions very little for moose in the project area and wildlife analysis area.

Threatened and Endangered Wildlife Species

The project is in Latah County, the wildlife analysis area includes portions of Benewah and Shoshone Counties. The U. S. Fish and Wildlife Service (USFWS) in their Species Lists for those three counties

identified three listed wildlife species that may occur: bald eagle, Canada lynx, and gray wolf. Table 34 provides a short synopsis of the listed species, their habitat, and the existing condition within the wildlife analysis area.

Table 34 - Listed Wildlife Species

Common Name	Habitat	Existing Condition in the Wildlife Analysis Area
Bald Eagle	Nest near large bodies of water in areas relatively free from disturbance. Perch sites, roost sites and access to prey are essential components of winter habitat.	No large bodies of water are present and availability of prey is low. No nests are known or suspected. District records indicate occasional sightings.
Canada Lynx	Forests that provide a prey base of snowshoe hare (generally above 4,000 feet). Forage habitat - late and early successional stages with high stem/ branch density; dens - associated with down logs and overhead cover in/adjacent to forage habitat.	Based on elevation, forest type, and potential vegetation (habitat type) the WL analysis area contains insufficient capable habitat to support the species and is not in a Lynx Analysis Unit.
Gray Wolf	Large areas with high prey densities and isolation from human activities. Availability of den and rendezvous sites.	No evidence of den or rendezvous sites. Based on its location relative to surrounding human disturbances habitat is considered low to moderate quality.

The wildlife analysis area was not included in any Lynx Analysis Unit on the district and is not considered capable of providing sufficient habitat for resident lynx. The project (and analysis) is consistent with direction in the Canada Lynx Conservation Assessment and Strategy. There would be no effect on this species and no further analysis is needed or required.

Bald Eagles

Bald eagles occupy riparian or lacustrine habitat almost exclusively during the breeding season (USDI, 1994). They select isolated shoreline areas with larger trees to pursue such activities as nesting, feeding, and loafing. Components of nesting habitat include proximity to sufficient food supply, the presence of dominant trees, and line-of-sight to a large body of water (often within 0.25 mile of water). Nest sites are commonly distributed around bodies of water $\geq$80 acres or major rivers.

Because of the sightings in the E.F. of Emerald Creek (but not in the project area) and because the proposed project would occur in riparian areas the bald eagle will be analyzed further. Impacts on forest structure near riparian habitat and levels of disturbance are used to measure potential impacts on bald eagles.

Existing Condition & Environmental Consequences

Occasional sightings of bald eagles have been recorded in the lower St. Maries River. District sighting information indicates very limited use of the St. Maries River during winter and the area is not considered bald eagle wintering habitat. There are no bald eagle nests within 20 miles of the analysis area. Based on the above information, bald eagles are not expected to occur in the project or analysis area.

There are no large bodies of water in the project or analysis area. Based on existing disturbance factors (e.g. distance to open road), the limited occurrence, the size of the East Fork of Emerald Creek and the prey base, the quality of bald eagle habitat is considered low at best (USDI, 1994).

See the riparian habitat section for a more complete discussion of the existing condition of the riparian habitat.

There would be no impacts on bald eagles. The absence of a large body of water, low availability of prey in E.F. Emerald Creek, and proximity to an open forest road preclude other than opportunistic incidental use of the project area by the species.

Gray Wolf

Historically wolves were distributed throughout most of Idaho in unknown populations. Wolf packs of 4 to 10 animals appear to have ranged widely in the mountains of northern and central Idaho. A decline of native ungulates, control programs designed to eradicate wolves and conflicts with livestock and humans caused the decline of wolf populations in Idaho and led to the absence of a breeding population in Idaho (Hansen, 1986).

The Emerald Creek Garnet Area wildlife analysis area falls within the Central Idaho reintroduction area where gray wolves are classified as nonessential experimental populations. This classification treats wolves as proposed for listing under the ESA (i.e. instead of endangered). The reintroduction of wolves in Central Idaho did not envision conflicts with current or anticipated management actions. No changes in land use restrictions (other than the possibility of temporary restrictions near den sites) are required because of the reintroduction.

High prey densities - particularly big game - and minimal conflict with human interests and uses characterize wolf habitat. Other important habitat features for wolves include den and rendezvous sites (Hansen, 1986).

The wolf is a wide-ranging species and the possibility of their presence can not be totally dismissed. However, the nearest known gray wolf territory is approximately 18+ miles from the project area and the human disturbance level (e.g. campground, highway and residences between project and known territory) make it unlikely that wolves would occur in the area as other than perhaps transitory individuals, especially in the near future. Human disturbance as measured by open road densities is used to disclose potential effects in this analysis.

Existing Condition

There are no known wolf dens or rendezvous sites in the wildlife analysis area or the St. Maries Drainage (Mack et. al., 2005). Existing total road density in the wildlife analysis area is 4.5 mi/mi^2 and open road density is 2.2 mi/mi^2.

The assessment of existing conditions (and potential effects) on prey (e.g. elk) is derived from past analyses, and given the scope of the project and risk to species, provides sufficient information for this analysis.

Potential elk use is a measure of prey availability (see the previous section on elk in this document). The potential elk use value (EHP) in the Emerald evaluation area (from the Emerald Resource Unit FEIS) will be approximately .46 when activities associated with that analysis are concluded.

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

Habitat relationships, the scope of the project, and the location of the project result in a low potential for effects (e.g. disturbance of transient individuals). Any effects on individuals that may happen would be inconsequential. The wolf is a wide ranging species and the possibility of their presence can't be totally dismissed. However, the nearest known gray wolf territory is approximately 18+ miles from the project area and the human disturbance level (e.g. campground, highway and residences between project and known territory) make it unlikely that wolves would occur in the area as other than perhaps transitory individuals, especially in the near future.

Sensitive Wildlife Species

Sensitive species are determined by the Regional Forester (FSM 2670.5) and are those species for which population viability is a concern. The National Forest Management Act directs the Forest Service to review programs and activities to ensure that species do not become threatened or endangered as a result of Forest Service actions. The ICB Assessment found that species that are likely in decline (includes many Sensitive species) are associated with landscape and habitat components that are declining. Forest Plan direction for the Idaho Panhandle National Forests (IPNF) states that habitat of sensitive species will be managed to prevent further declines in populations to prevent federal listing.

This analysis identified capable and suitable habitat based on the latest scientific literature for each species and available data in the TSMRS/FSVeg database. Impacts on acres of suitable habitat are measured by alternative and discussed for each species as appropriate.

Sensitive species on the Regional Foresters list were screened for their relevancy to the wildlife analysis area and the proposed action. See the Species Relevancy Screen and Rationale for no Further Analysis sections of this document for additional discussions regarding analysis needs of sensitive species. Further information can also be found in the project file (WL-3). Based on species occurrence, habitat capability and suitability, and the likelihood or risk of potential impacts on habitat and the species, there would be no impact on species identified in the Species Relevancy process as needing no further analysis.

Table 35 displays sensitive wildlife species from the U.S. Forest Service Region One list that may be impacted by the proposed action and/or alternatives, a short description of habitat requirements, and comments regarding habitat capability/suitability. A more detailed analysis for each species follows the table. The Summary of Conclusion of Effects for Sensitive Wildlife Species is included in Appendix G.

Table 35 - Sensitive Wildlife Species and Habitats

Common Name	Habitat	Comments
Black-backed Woodpecker	Conifer forests, dead/dying trees (especially fire killed).	Suitable habitat in wildlife analysis area.
Flammulated Owl	Mature to old growth ponderosa pine/Douglas-fir forests.	Limited capable and no suitable habitat within wildlife analysis area.
Pygmy Nuthatch	Strong preference for mature to old ponderosa pine, cavity availability important.	Limited capable and no suitable habitat within wildlife analysis area.
Fisher/Marten	Mature and old growth forests (riparian linkages).	Suitable habitat available within wildlife analysis area. Fisher and marten occupy similar habitat.
Fringed Myotis	Prefers dry Douglas-fir and ponderosa pine forests, forages over riparian and wetland areas.	Limited amount of dry forest within wildlife analysis area.
North American Wolverine	Areas of adequate food supply in large remote areas.	Limited capable or suitable habitat in wildlife analysis area.
Northern Goshawk	Nest stands - mature to old growth forests	Suitable habitat in wildlife analysis area.
Western Toad	Breed in lakes, ponds, streams and persistent water sources.	Potential habitat present in wildlife analysis area.

Black-backed Woodpecker

Black-backed woodpecker occurrence has been positively correlated to outbreaks of wood boring or bark beetles (e.g. from fire, windfall, or disease). However, they may be well distributed but relatively uncommon in the natural landscape (Samson, 2005). They nest in snags or in live trees with heart rot, which are at least five inches in diameter. Black-backed woodpeckers feed primarily on wood-boring beetles and specialize on large areas of recently killed, beetle-infested timber. Breeding densities of black-backed woodpeckers vary considerably in response to prey availability. They are specialists in exploiting recent forest fires, especially for the first three to five years after burning, and rapidly utilize new burns (Hutto, 1995). Historically, mixed severity and stand replacing fires produced new habitat annually - in greater amounts than is presently produced under a fire suppression strategy. Black-backed woodpecker habitat is also considered to be old forests and younger stages of lodgepole pine (Wisdom et al. 2000).

Black-backed woodpecker surveys have been conducted in the St. Maries River Drainage and their presence was confirmed. Based on literature descriptions and field verification of habitat, capable and suitable habitat is available within the Emerald Creek Garnet Area wildlife analysis area.

Existing Condition

There are no significant areas with outbreaks of wood boring or bark beetles in the analysis area. There is one small area (approximately two acres) of recent fire-killed trees and five areas identified as having mortality from bark beetles (number of trees affected range from 1 – 100). There are 1,141 acres of mature sawtimber size stands, an additional 219 acres that meet the old growth definition with a size class of immature sawtimber or multi-storied, and 354 acres of immature sawtimber size lodgepole pine for a total of approximately 1,763 acres that is considered suitable habitat.

Due to the fire history and past logging in the drainage there is a relatively low level of mature/old forest structure in the St. Maries River Drainage; and current fire suppression policy is not conducive to the creation of sizable areas of fire-killed trees. Both of these conditions may be affecting populations of black-backed woodpeckers.

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

Direct, indirect, & cumulative effects (see the Forest Structure section) would not be expected to affect black-backed woodpecker occurrence in the area, and by extension there would be no effect on populations. There would be no direct or indirect effect on fire-killed trees or on any significant area of beetle infestation. Based on the amount of old growth, mature forest structure, and immature sawtimber size class available in the analysis area the analysis area would continue to provide habitat for black-backed woodpeckers at existing levels.

There would be no cumulative effects associated with this project or analysis area that would jeopardize populations of black-backed woodpeckers. This is based on the limited effects from this project, the maintenance of suitable habitat and home ranges in the analysis area, and habitat estimates across Region 1 and the IPNF that show habitat is abundant (Samson, 2005).

Flammulated Owl

Flammulated owls are seasonal migrants that occupy home ranges in the northern latitudes during the spring, summer and fall. They are cavity nesters that depend upon naturally-occurring or excavated cavities for nesting. Consequently, snags and other defective trees are an important component of their breeding habitat.

These owls are attracted to relatively open, older forests featuring ponderosa pine and Douglas-fir that are correlated with drier habitats. Reynolds and Linkhart (1992) reported that all published North American records of nesting, except one, came from forests in which ponderosa pine was at least present, if not dominant. The flammulated owl's preference for ponderosa pine and/or Douglas-fir can also be linked to prey availability (primarily moths, beetles, crickets). Reynolds and Linkhart noted a stronger correlation between prey availability and ponderosa pine and Douglas-fir, than with other common western conifers.

Existing Condition

Based on potential vegetation (i.e. vegetation habitat types), there are 37 acres of capable flammulated owl habitat in the wildlife analysis area. There is no suitable habitat at this time; capable stands are forested by unsuitable cover types (e.g. white pine, grand-fir).

There are no reported occurrences of flammulated owls in the Emerald Creek Garnet Area wildlife analysis area. The fire history and past logging (c. 1930s) resulted in a low level of mature/old forest structure in the drainage; and current fire suppression policy is not conducive to the creation and maintenance of areas of more open-grown stands of ponderosa pine. At best, the area provides only marginal habitat for this species. The species is considered not present to relatively uncommon in the St. Maries Drainage compared to other areas on the St. Joe District.

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

There would be no effects on flammulated owls. There is no capable flammulated owl habitat in the project area. There are no reasonably foreseeable future actions that would affect flammulated owl habitat in the wildlife analysis area.

Pygmy Nuthatch

The pygmy nuthatch shows a strong and almost exclusive preference for ponderosa pine habitat (Ghalambor, 2003), especially mature to late seral stands that are fairly open (<70% canopy cover). Secondary habitats that the species may use include Douglas-fir, juniper, and aspen. Species abundance is directly correlated with snag density (i.e. cavity availability). They feed on pine seeds and insects extracted from the bark of trees. Risks to the species include: 1) timber harvest that results in the loss and fragmentation of late seral, large-diameter live ponderosa pine stands, and large snags, 2) fire exclusion resulting in a shift in stand composition from shade-intolerant, mid-seral species to shade-tolerant, late-seral species, 3) human development that modifies and reduces habitat, and 4) livestock grazing that affects fuels as related to fire exclusion.

Existing Condition

Based on habitat relationships and potential vegetation (i.e. vegetation habitat types), there are 37 acres of dry site in the analysis area that is considered capable of providing preferred habitat. There is no suitable habitat, at this time these stands are forested by unsuitable cover types (e.g. white pine, grand fir). There are 257 acres of potential secondary habitat (e.g. “mature” or multistoried Douglas-fir forest type) in the analysis area.

There are no reported occurrences of pygmy nuthatches in the Emerald Creek Garnet Area wildlife analysis area. The fire history in the drainage has resulted in a low level of mature/old forest structure in the drainage; and current fire suppression policy is not conducive to the creation and maintenance of areas of more open-grown stands of ponderosa pine. At best, the area provides only marginal habitat for this species

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

There would be no effects on pygmy nuthatches. There is no preferred or secondary habitat in the project area. There are no reasonably foreseeable future actions that would affect pygmy nuthatch habitat in the wildlife analysis area.

Fisher (and Marten)

Fisher and marten occupy similar habitat (Ruggiero et. al., 1994) and potential impacts are analyzed for both species using the same methodology (the marten is a MIS and not a sensitive species but is addressed in this section of the document).

Fisher occur most commonly in landscapes dominated by mature forests and prefer late seral stage coniferous and mixed forest habitat. They utilize forest riparian habitats as resting sites and use them extensively for travel. Fisher appear to avoid deep, fluffy snow, high elevations (> 4,000 ft.) and non-forested areas (Ruggiero, et. al. 1994). Extensive alteration of late-successional forests (e.g. from fire, timber harvest or clearing for agriculture) that reduces canopy closure, snags, and down woody material may reduce its habitat value for fisher (Ruggiero, et. al. 1994).

Marten are associated closely with late-successional stands of mesic conifers (Ruggiero et. al., 1994). In the western United States martens are most abundant in mesic mature to over-mature spruce/fir forests where small mammal prey species are most abundant (USDA, 1990). In general, marten prefer forest stands with greater than 40 percent tree canopy closure, and large down logs, stumps, and snags which provide access to prey under the snow and denning sites. Use or selection of riparian zones by marten has been reported in the literature (Ruggiero et. al., 1994).

Methodology

To conduct the analysis, assess potential effects and compare alternatives, the analysis uses management guidelines from *Fisher Biology and Management in the Western United States* (Heinemeyer and Jones, 1994). The percent of the area in mature/old forest structure (i.e. suitable habitat) is displayed for each alternative and compared to the guidelines. Changes from the existing condition are displayed and discussed relative to guidelines for forest structure.

The goal at the scale of this analysis (i.e. the Emerald Creek Garnet Area wildlife analysis area or “subdrainage”) is to maintain functional home ranges (Heinemeyer and Jones, 1994). However, there are many elements (such as the percentage of private lands and the amount of agricultural lands) that conflict with and limit the “suitability” of fisher/marten habitat in the surrounding landscape and St. Maries River Drainage. Regardless of management of the NFS lands, it is debatable whether the surrounding subdrainages could/would be managed to provide multiple home ranges. The resolution of this situation is beyond the scope of a project-level analysis.

Forest carnivore conservation/management requires an ecosystem management approach at a scale larger than the wildlife analysis area, the St. Maries River Drainage, the St. Joe River Drainage or the IPNF. There is no existing management strategy at a Regional or State level. It is therefore difficult to put the habitat in the St. Maries Drainage and wildlife analysis area into a landscape perspective. However, current literature (including existing draft assessments and strategies) can be used to identify capable and suitable habitat,

establish existing conditions, display/discus potential effects on suitable habitat, and evaluate the effects of management actions on the survival of individuals and persistence of populations.

While trapping is a parameter affecting habitat for forest carnivores, the Forest Service has no jurisdiction concerning trapping; and it is beyond the scope of this project analysis. However, road densities affect vulnerability (to trapping) and are addressed.

Existing Condition

Vegetation/Habitat

Late successional habitat is an essential component of forest carnivore habitat. The physical structure of the forest appears to be more important for fisher and marten than the species composition (Ruggiero et. al., 1994).

Habitat management considerations for fisher and marten emphasize maintaining late successional forest habitat. Mature riparian forest is especially important for denning sites and travel ways. Based on habitat requirements, the quality, amount and distribution of late successional forest habitat within the drainage is considered the most important factor for fisher and marten.

On NFS land in the Emerald Creek Garnet Area wildlife analysis area there are 6,305 acres identified as capable fisher/marten habitat (i.e. the appropriate habitat types / potential vegetation), 37 acres that are not capable habitat, and 164 acres with no data to determine capability. There is no data on the 444 acres of non-NFS lands to determine capability. However, based on the predominance of capable habitat types the 608 acres with no data are considered capable. This results in ≈ 6,913 acres of capable fisher/marten habitat; not all of which is suitable (e.g. suitable denning habitat) at this time.

The existing condition of forested habitat (based on size class) on NFS lands in the Emerald Creek Garnet Area wildlife analysis area and the guidelines for forest structure by subdrainage are displayed in Table 36.

Table 36 - Existing Condition & Guidelines for Forest Structure

			Subdrainage Guidelines		
Forest Structure	**Existing Condition***		**High Quality**	**Moderate Quality**	**Low Quality**
Mature/older forest	1,141	16%	65-75%	≥40%	30-40%
Young forest**	3,799	55%	10-25%	na***	na
Pole/sapling	1,200	17%	10-25%	na	na
Open/seed	346	5%	na	na	na
No data****	463	7%			

** percentages are the % of NFS capable habitat in the wildlife analysis area*
*** includes multistory stands*
**** not applicable – no guidelines identified*
***** no data on size class – includes 444 acres of non-NFS land*

A query of the TSMRS/FSVeg databases identified 901 acres of suitable fisher denning habitat in the wildlife analysis area. Based on the amount of mature and older forest structure, the existing condition of the Emerald Creek Garnet Area wildlife analysis area is below the criteria needed for a low quality subdrainage. This is due primarily to the fire history (and ensuing historic logging) that results in the majority of the stands being classified as immature. It should be noted that the surrounding landscape is primarily non-NFS land that does not provide much, if any mature or older forest habitat.

Impacted riparian zones are also affecting fisher habitat. See the previous section on riparian habitat for further discussion on effects on riparian habitat.

Access/Vulnerability Risk

Trapping-vulnerability risk has been cited as one of the factors affecting forest carnivores (Heinemeyer and Jones, 1994). Roads are correlated with trapping-vulnerability and human disturbance. Areas with greater than or equal to 1 mi/mi^2 road densities have a high risk to trapping vulnerability for fisher.

In the Emerald Creek Garnet Area wildlife analysis area there is a total road density of 4.5 mi/mi^2. There are approximately 23.5 miles of open road that results in an open road density of 2.2 mi/mi^2. This constitutes a high risk to trapping vulnerability.

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

The effects on forest structure are minimal (see the effects on Forest Structure). Direct and indirect effects on immature sawtimber size forest structure associated with the vegetation removal would have negligible effects on fisher/marten habitat attributes. There would be no direct or indirect effect on old growth and no change in the acres of allocated old growth. There would be no direct or indirect effect on mature/sawtimber size forest structure. Public garnet gemstone collecting would remove approximately 3 – 10.5 acres of immature sawtimber forest structure which represents at most 0.4 % of that structure in the analysis area.

Potential impacts in and adjacent to riparian habitat along with disturbance associated with the mining in 281 Gulch and Garnet Gulch may affect fisher/marten use in those drainages (See the riparian section). However, when put into perspective (e.g. 2,600 linear feet out of 39,350 linear feet - < 7% - in the project area) the effects would be minimal and would not affect use in the analysis area. The riparian restoration would result in long term improvements in riparian habitat (See the riparian section).

The analysis of access/disturbance reveals that there would be a minimal change in road miles. Therefore, there would be no change in trapping –vulnerability risk.

Cumulative Effects

There would be no effect on the capability of the analysis area to support fisher or marten. Based on the limited direct and indirect effects on vegetation/habitat and the existing condition, there would be no substantial addition to exiting effects from past, present and reasonably foreseeable actions. The analysis area would remain a low-quality subdrainage for fisher/marten until succession moves the large amount of existing immature sawtimber size class stands to maturity. Approximately 68% of the analysis area has the potential to remain/succeed to mature forest structure and become a high-quality subdrainage – i.e. when the immature sawtimber stands become mature stands.

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on trapping-vulnerability of fisher or marten. However, anticipated management of the non-NFS lands in the surrounding landscape are expected to maintain road densities at a level that constitutes a high risk to trapping-vulnerability.

Fringed Myotis

This bat is mostly found in dry habitats where open areas (e.g. grasslands) are interspersed with mature forests (usually ponderosa pine). Ideal habitat includes nearby water sources and cliffs or snag roost habitat (Keinath 2004). They forage for insects in riparian and wetland areas. They have been captured in ponderosa pine and Douglas-fir forest while foraging over willow/cottonwood areas. They use caves, buildings, bridges, crevices and large cavities for roosting. Risks to the species include: 1) loss of existing and potential roost sites from mine closures, snag removal, and destruction/fumigation of buildings, 2) roost abandonment from excessive disturbance of roosting bats – e.g. recreational caving and road access as an indirect facilitator of such activities, and 3) degradation and loss of native riparian vegetation.

Existing Condition

No suitable habitat exists in the project area or analysis area, based on habitat types and existing forest types. There are 37 acres capable of providing dry coniferous forest habitat in the analysis area, at this time these stands are forested by unsuitable cover types (e.g. white pine, grand fir). There are no mines/caves for maternity colonies and hibernacula in the project or analysis area. At best, the analysis area provides only marginal habitat for this species

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

There would be no effects on fringed myotis. There is no dry coniferous habitat in the project area. There are no reasonably foreseeable future actions that would affect dry coniferous habitat in the wildlife analysis area. The project would affect riparian habitat, however, because of the lack of dry forests the project is not a risk to the species.

Wolverine

Wolverines are low-density, wide-ranging species that inhabit remote forested areas, ranging over a variety of habitats. Home ranges of resident female wolverines range from 11.6 mi^2 to over 300 mi^2 in Montana and Idaho. Wolverines tend to use lower elevations in the winter and higher elevations in summer, when these areas provide the greatest potential food supply and in response to temperatures and human recreational activity (Hornocker and Hash 1981). The availability of large mammal (i.e. ungulate) carrion as food is important for the distribution, survival, and reproductive success of wolverines (Ruggiero et. al., 1994). Wolverines appear to be tied to low human occurrence; especially undisturbed seclusion for reproducing females (Copeland, 1995).

Factors with the potential to threaten local population viability of the species include reduction of "wilderness refugia" or natural reserves (i.e. large areas of habitat with limited human access) and food availability (Butts, 1992).

Management objectives for wolverine at the drainage level primarily involve maintaining quality habitat by managing road systems to limit disturbance and reduce risk of displacement during critical wolverine denning periods (IDFG, 1995).

Existing Condition

Wolverine tracks have been reported in the wildlife analysis area. The sighting(s) most likely represent a transient individual. In a district-wide assessment, potential wolverine natal denning habitat was not identified in or adjacent to the wildlife analysis area. In the Emerald Creek Garnet Area wildlife analysis area there is a total road density of 4.5 mi/mi^2. There are approximately 23.5 miles of open road that results in an open road density of 2.2 mi/mi^2. The territory size requirements, lack of denning habitat, and existing access in the wildlife analysis area and surrounding drainages preclude the likelihood of other than incidental occurrence within the wildlife analysis area.

Environmental Consequences

Common to All Alternatives

Direct, Indirect & Cumulative Effects

Based on the existing condition (e.g. no denning habitat and road densities), nature of wolverine occurrence and limited effects (e.g. on forest structure and access) there would be no impact on wolverines.

Northern Goshawk

Goshawks use a variety of forest types, structures, and successional stages, but have been primarily associated with mature and late successional habitat. For nesting, goshawks appear to utilize mature to old growth stands on gentle to moderately steep slopes. Nest site characteristics also appear to be tied to slope position, aspect, canopy closure, and basal area. Forest habitat, pole stage or larger, which is open enough to allow unimpeded flight through the understory is considered suitable for foraging.

The analysis of effects on goshawks uses direction in *Old-Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains* (USDA, 1990), *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et. al. 1992) to determine potential effects. The analysis is tiered to the analysis done for forest structure.

Geographic Scope

Goshawk territory sizes range from approximately 1,235 to 9,880 acres (Samson, 2005). Assessment areas of 5,000 acres - minimum - (Warren, 1990) and 5,400 acres - not including nest areas, post fledging area, and natural or created openings – (Reynolds, 1992) have been recommended for evaluation of potential goshawk suitability. The Emerald Creek Garnet Area wildlife analysis area, (6,950 acres) was delineated for the purpose as serving as the analysis area for multiple species including goshawks.

Management recommendations for each home range include approximately three suitable nest areas and three replacement areas (in a developmental phase) per home range and a mosaic of vegetation structural stages in both an approximately 420-acre post-fledging family area (PFA) and a 5400-acre foraging area.

Existing Condition

Based on literature descriptions and field verification of habitat, there is capable and suitable habitat available within the project area and the Emerald Creek Garnet Area wildlife analysis area. Goshawks are occasionally sighted within the wildlife analysis area and there are records of one known nest in the area. The nest was discovered in 1991, and the last known occupancy was in 1993. An intensive survey in 1996 failed to relocate the nest or detect goshawk presence, and a search in 2003 also failed to locate a nest or detect goshawks. The present status of the nest/territory is unknown.

Table 37 displays the existing conditions in the wildlife analysis area (e.g. goshawk assessment area/home range) and the desired percent of each vegetation structure.

Table 37 – Existing Condition for Goshawk Assessment Area/Territory

Project wildlife analysis area	6,950	9+	198 3%	1,309 20%	39 1%	4,940 77%	10%	10%	20%	60%

**The exact number of potential nest areas depends on how patches of at least 30 acres in size are counted. This value represent a minimum number based on a conservative approach when assessing nest areas.*

Based on the IPNF wildlife query there are 4,636 acres of capable goshawk nesting habitat of which 576 acres are presently suitable nesting habitat.

Environmental Consequences

Common to All Alternatives

Direct & Indirect Effects

Direct and indirect effects on immature sawtimber-size forest structure associated with the vegetation removal would have negligible effects on goshawk habitat attributes. There would be no direct or indirect effect on old growth and no change in the acres of allocated old growth. There would be no direct or indirect effect on mature/sawtimber-size forest structure. Public garnet collecting would remove approximately 4 – 10.5 acres of immature sawtimber forest structure which represents at most about 0.4 % of that structure in the analysis area. The effects on forest structure are minimal (see the effects on Forest Structure). The potential for disturbance of old growth associated species is low and inconsiderable.

Cumulative Effects

Based on the amount of old growth, mature forest structure, and immature sawtimber size class available in the analysis area the analysis area would continue to provide suitable habitat for goshawks, cumulative effects would not be expected to affect goshawk occurrence in the area, and by extension there would be no effect on populations. The cumulative effects on forest structure are minimal at the wildlife analysis area scale (See the Forest Structure Section).

There would be no cumulative effects associated with this project or analysis area that would jeopardize populations of northern goshawks. This is based on the limited effects from this project, the maintenance of suitable habitat and home ranges in the analysis area, and habitat estimates across Region 1 and the IPNF that show habitat is abundant (Samson, 2005).

Western Toad

Western toad breeding habitat includes shallow, quiet water in lakes, marshes, bogs, ponds, wet meadows, and other persistent water sources. Young toads are restricted in distribution and movement by available moist habitat, while adults can move several miles and reside in marshes, wet meadows, or forested areas. Toads hibernate in the winter in habitats that maintain a high humidity and above-freezing temperatures. Areas that provide shelter for hibernating toads include rodent burrows, beaver dams and slash piles (Loeffler, 1998).

Reasons for the decline of the western toad have not been defined with any degree of certainty. However, habitat alterations from timber harvest, grazing, recreation, and water development would likely not be beneficial to long-term enhancement of western toad habitats (Loeffler, 1998). One hypothesis explaining the western toad decline concerns mortality caused by disease or some other widespread agent. However, none of these factors have been shown as causative agents for population declines. Since this species depends on wetlands to breed, the reduction of or adverse impacts on wetlands potentially have detrimental effects on western toads.

It is important that toads be able to move among their seasonal habitats. The biggest potential barriers to their movement are roads. Steep roadcuts can be a barrier to toads moving between seasonal habitats. Juvenile toads are vulnerable to being killed by motorized vehicles when they are dispersing from their natal ponds.

Existing Condition

Western toads have been found at various locations in and adjacent to the analysis area (WL-29), in both riparian and upland habitats. They have been found at and near the garnet collecting site in 281 Gulch (WL-28). A recent FEIS prepared for Emerald Creek Garnet Ltd. (WL-30) for a project approximately seven miles north of this project area identified boreal toads as a common wildlife species using wet meadow habitats.

Riparian habitat downstream from the current garnet collection site in the West Fork of 281 Gulch and in Garnet Gulch provides areas of suitable breeding habitat. Based on habitat needs as described in the literature, the mesic nature of much of the forests of the IPNF indicates that toads have many opportunities to find persistent small water sources for breeding, and could successfully disperse through moist forest.

Environmental Consequences

Common to all Alternatives

Cumulative Effects

The proposed actions(s) would contribute to additional disturbance of western toads and their habitat. However, the toads continued presence down stream from the current garnet collection site in 281 Gulch and design features of the proposed actions indicate it is unlikely that past, present and reasonably foreseeable future actions would contribute to a trend towards federal listing or cause a loss of viability to the population. Specific features of the proposed actions and/or alternatives that limit the potential for impacts include: a) no additional digging in the West Fork of 281 Gulch (where toads have been found), b) riparian disturbance would be kept to the smallest area practicable in any one year, and c) during reclamation, the existing amount of persistent pooled water would be maintained or increased. There are no other reasonably foreseeable future projects that would affect western toad breeding habitat. All other activities would have no effect on riparian habitat and only negligible effects on western toad movement and disturbance and/or direct mortality.

Alternative A

Direct & Indirect Effects

Based on the limited scope of the activities in this alternative (e.g. not moving to Garnet Gulch and no additional dig sites in the West Fork of 281 Gulch), the operation and rehabilitation plan (e.g. rehabilitation in Pee Wee, No Name and 281 Gulch), design features (e.g. P1 - riparian disturbance would be kept to the smallest area practicable in any one year, and P2 - during reclamation, the existing amount of persistent pooled water would be maintained or increased), the continued presence of boreal toads downstream from the current garnet collection site, and the availability of habitat throughout the Emerald Creek drainage, the impacts to riparian habitat are not expected to affect the population viability of western toads.

The continuation of recreational mining for garnets in 281 Gulch would impact ≈ one acre of riparian habitat. Based on the confirmed presence of western toads, alteration of habitat would likely impact potential breeding habitat for the western toad. It is also likely that there would be some short-term displacement of individuals and some unavoidable direct mortality of individuals associated with the mining operation. However, this impact has not been shown to eliminate western toads from the drainage. Western toads have been seen in the small water-filled depressions that resulted from garnet digging and in the settling ponds used to reduce sediment at the existing site. All areas impacted by mining would be reclaimed in the same year as excavation. This reclamation would be designed to restore – as much as possible – breeding habitat for western toads (see the Riparian Habitat section).

Alternatives B & C

Direct & Indirect Effects

Based on the limited scope of the activities in these alternatives (e.g. no additional dig sites in the West Fork of 281 Gulch and additional garnet removal only in the main stem of 281 Gulch, the East Fork of 281 Gulch, and Garnet Gulch), the operation and restoration plan (e.g. restoration in Pee Wee, No Name, 281 Gulch, and reclamation in Garnet Gulch), design features (e.g. P1 - riparian disturbance would be kept to the smallest area practicable in any one year, and P2 - during reclamation, the existing amount of persistent pooled water would be maintained or increased), the continued presence of boreal toads downstream from the current garnet collection site, and the availability of habitat throughout the Emerald Creek Drainage, the impacts to riparian habitat are not expected to affect the population viability of western toads. Forest Service

recreational mining of garnets would impact a total of ≈ 3.2 acres of riparian habitat in 281 Gulch and Garnet Gulch. Based on the confirmed presence of western toads, alteration of habitat would likely impact potential breeding habitat for the western toad. However, this impact has not been shown to eliminate western toads from impacted drainages (e.g. in 281 Gulch). Western toads have been seen in the small water-filled depressions that resulted from garnet digging and in the settling ponds used to reduce sediment at the existing site. It is also likely that there would be some unavoidable direct mortality of individuals.

Design features are included that are intended to provide undisturbed habitat and a possible refuge. The fact that adult toads commonly use upland habitats also provides an avenue of escape from direct mortality.

Consistency with Forest Plan and Laws

All alternatives are consistent with applicable goals, direction, standards, and guidelines from the Forest Plan for the management of wildlife habitat and species populations. All alternatives comply with other direction and recommendations regarding management of the various components of wildlife habitat including the percent old growth allocated and size of old growth units/patches. All alternatives comply with applicable conservation strategies for wildlife species. All alternatives are consistent with the Endangered Species Act (ESA), the National Forest Management Act (NFMA), and other direction and requirements for the management of wildlife species and habitat.

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