Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

for the
Effects to Grizzly Bear and Bull Trout from the Implementation of
Proposed Actions Associated with Plans of Operation for:

Sterling Corporation Rock Creek Silver/Copper Mine

Agency:	U.S. Department of Agriculture Kootenai National Forest
Consultation Conducted by:	U.S. Fish and Wildlife Service Montana Field Office
Date Issued:	December 15, 2000

Table of Contents

CONSULTATION HISTORY 2
BIOLOGICAL OPINION 2
DESCRIPTION OF PROPOSED ACTION 2
- **PART A - GRIZZLY BEAR** 10
  - **BACKGROUND** 10
  - **STATUS OF THE SPECIES/CRITICAL HABITAT** 16
  - **ENVIRONMENTAL BASELINE** 22
  - **EFFECTS OF THE ACTION** 42
  - **CUMULATIVE EFFECTS** 70
  - **CONCLUSION** 71
  - **REASONABLE AND PRUDENT ALTERNATIVE** 73
  - **INCIDENTAL TAKE STATEMENT** 79
  - **REASONABLE AND PRUDENT MEASURES** 82
  - **CONSERVATION RECOMMENDATIONS** 83
- **PART B - BULL TROUT** 84
  - **STATUS OF THE SPECIES** 84
  - **ENVIRONMENTAL BASELINE** 89
  - **EFFECTS OF THE ACTION** 99
  - **CUMULATIVE EFFECTS** 106
  - **CONCLUSION** 107
  - **INCIDENTAL TAKE STATEMENT** 107
  - **REASONABLE AND PRUDENT MEASURES** 109
  - **CONSERVATION RECOMMENDATIONS** 114
- **REINITIATION - CLOSING STATEMENT** 114

REFERENCES—GRIZZLY BEAR 116

REFERENCES–BULL TROUT 123

Appendix A
- **Complete Alternative V Description**

Appendix B
- **Grizzly Bear Mortality Table**

Appendix C
- **Terrestrial Threatened and Endangered Species Mitigation Plan for the Proposed Sterling Rock Creek Mine**

Appendix D
- **Maps of Mining Activities in Rock Creek**

Appendix E
- **Map of Status of Bull Trout in the Kootenai River Basin**

FWS/R6
ES

Bob Castaneda, Forest Supervisor
Kootenai National Forest
1101 Hiway 2 West
Libby, Montana 59923

Dear Mr. Castaneda:

This document transmits the Fish and Wildlife Service's biological opinion based on our review of the proposed Sterling Mining Company's (Sterling) Rock Creek Copper/Silver Mine Project (Rock Creek Project) and associated mining operations located in the Rock Creek drainage which is a tributary to Cabinet Gorge Reservoir, on the lower Clark Fork River in western Montana, and its effects on the grizzly bear (*Ursus arctos*) and bull trout (*Salvelinus confluentus*). This biological opinion has been prepared in accordance with Section 7 of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.). This document was prepared by the Service in response to the request by the Kootenai National Forest (Kootenai) and the accompanying Biological Assessment (BA) dated July 31, 1998, amended May 13, 1999, and April 4, 2000, for formal consultation on the grizzly bear and bull trout.

The action analyzed in the BA was the preferred alternative, Alternative V, (Alt V) for the Sterling Rock Creek Project. The mine originally was proposed by ASARCO Incorporated, who sold the mine to Sterling on October 14, 1999. Sterling is the new project proponent and the preferred action remains as described in the Supplemental Environmental Impact Statement (SEIS) (Montana Department of Environmental Quality and U.S. Forest Service 1998), as clarified by Appendix A of this biological opinion, and as referenced in the BA.

The Kootenai and the Montana Department of Environmental Quality (MDEQ) are jointly completing the Final Environmental Impact Statement (FEIS) for this project. The FEIS will incorporate the Rock Creek Project biological opinion. A Record of Decision (ROD) will follow the FEIS. Once Sterling has met all of the requirements as described in the ROD and FEIS, the Kootenai will issue a letter of approval to proceed with the appropriate phase of the Rock Creek Project. The MDEQ will issue an exploration license, a hard rock mine permit, a Montana Discharge Elimination Pollution System permit and an air quality permit.

The Service concurs with the Kootenai's determination that the Rock Creek Project may affect but will not likely adversely affect the threatened bald eagle (*Haliaeetus leucocephalus*), the endangered gray wolf (*Canis lupus*) and the threatened Canada lynx (*Lynx canadensis*). The BA also addressed the peregrine falcon (*Falco perigrinus*) which was removed as a listed species on August 25, 1999, because of successful recovery. The Service also concurs that the project may adversely affect the threatened bull trout and the threatened grizzly bear.

CONSULTATION HISTORY

A complete consultation history of this project up to the final BA, dated July 31, 1998, is summarized in the BA, Appendix 3, received by the Service on August 3, 1998. On August 24, 1998, the Service responded with a letter of acknowledgment of receipt of the BAs for listed species. The BA was amended on May 13,1999, to address bull trout. This amendment was received by the Service on May 20, 1999. On June 1, 1999, the Service responded with a letter of acknowledgment of receipt of the revised BA for bull trout. Another amendment dated April 4, 2000, to address the listing of Canada lynx, was received on April 7, 2000. A summary of the preferred action (Alt V), which includes parts of the Rock Creek Project and mitigation factors, was received on October 3, 2000. Additional correspondence and information collected by phone, electronic mail and in person to clarify issues in the BA has been added to the administrative record on file in the Service's Helena, Montana, Field Office.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Kootenai's preferred alternative to Sterling's proposed mine plan is Alt V as described in Appendix A (Figure 1). The Kootenai proposes to authorize Sterling to implement Alt V, summarized in Appendix A, that includes the development of an evaluation adit, a 5.5-year construction period, 27.5-year operation/production period, and a 2-year reclamation period, for a 35-year or more life of mine (Table 1). Maps of the proposed mine and Lower Clark Fork River bull trout distribution are provided in Appendices D and E. Additional information is available in the DEIS and the SEIS.

The Rock Creek Project is a proposed 10,000-ton-per-day underground copper and silver mine in northwestern Montana. The proposed project would be operated by Sterling. The mine, mill, and other facilities would be located in Sanders County, Montana, about 13 miles northeast of Noxon, Montana. The project is similar in scope and operation to the currently inactive Troy Mine in Lincoln County, Montana. Sterling currently holds mineral rights under the Cabinet Mountains Wilderness and the proposed action is to develop those interests.

Alternative V would result in construction of an evaluation adit, mine, mill, tailings paste facility, rail loadout, reverse osmosis and passive biotreatment facility, and various pipelines and access roads. The Bottom-Up construction option for the paste facility would be used and final design would incorporate measures to meet visual impact mitigation and reclamation goals. Some mine water would be stored in underground workings during mine operation, but most excess water would be treated and discharged to the Clark Fork River.

The proposed permit boundary would encompass 1,560 acres, of which 482 acres are proposed to be disturbed by mining activity and 1,078 would remain undisturbed. Land encompassed by the proposed permit boundary is 48 percent private land and 52 percent National Forest System lands.

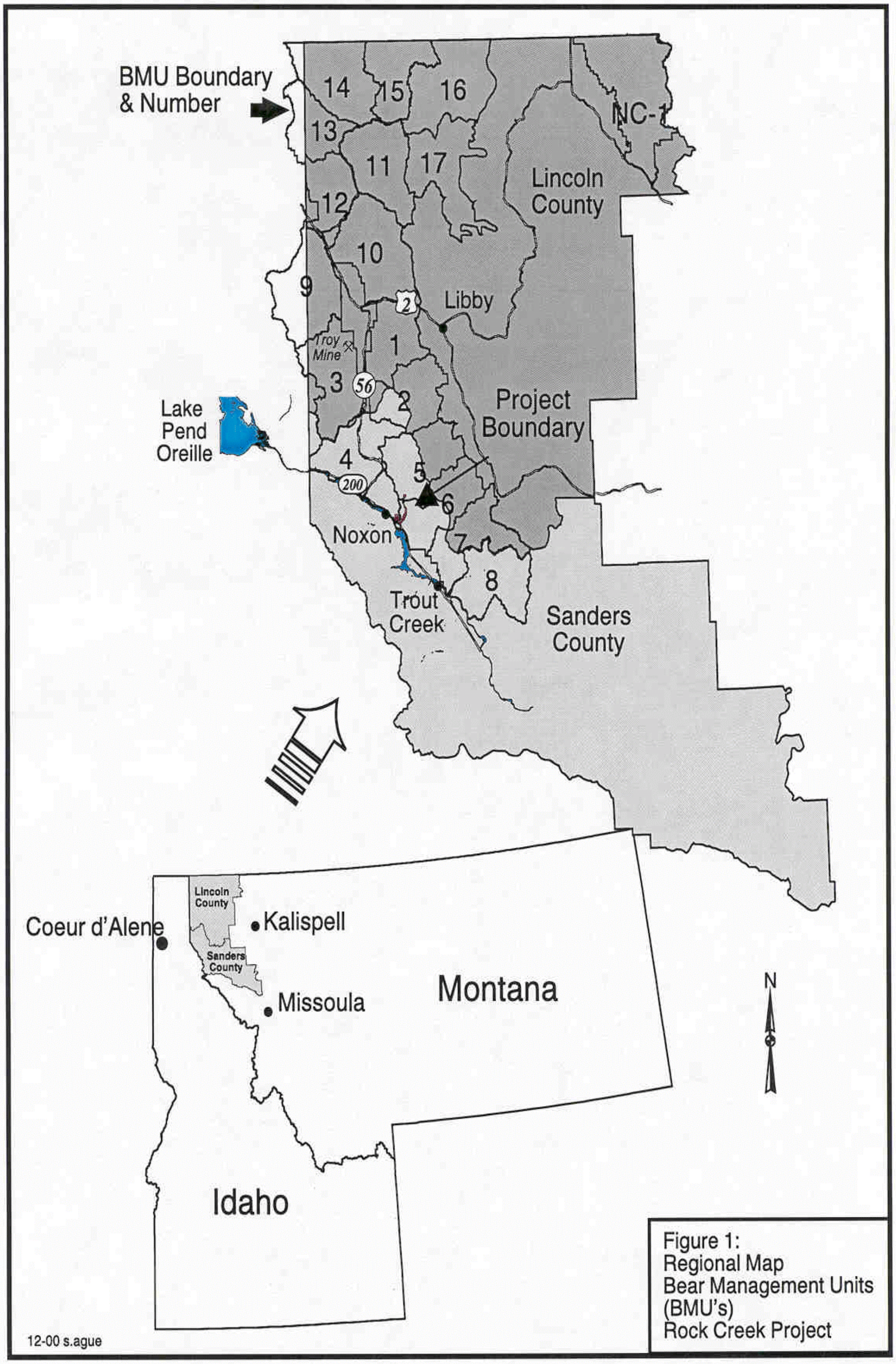


Figure 1:
Regional Map
Bear Management Units (BMU's)
Rock Creek Project

The project is very detailed and complex. Several check points are built into the development of the mine that require reconsideration should assumptions made in the Alt V analysis be found to differ than the assumptions analyzed. For example, initial exploration involves the drilling of an evaluation adit that will further investigate and define the underground ore body. Results of that evaluation adit may result in various scenarios described in Alt V. Should acid-forming rock be located, certain constraints would be required that will not be implemented if no acid-forming rock is encountered. Several similar check points and contingency plans occur throughout the life of the mine and will not be specifically addressed here.

Table 1. The Estimated Implementation Schedule for the Sterling Mining Company Rock Creek Project in Sanders County, Montana.

PROJECT YEAR	ACTIVITY
1 - 3	Evaluation adit construction
2 - 3	Mine development[1]
4 - 5.5	Mine development[1]/Surface Facilities Construction[2]
5.5 - 6	Start-up/limited production
7 - 33	Production
34 - 35	Reclamation

[1] Waste rock will be hauled mid-August through May during mine development period.
[2] Includes construction of the mill site, waste water treatment plant, paste plant, and utilities corridor.

The Rock Creek Project SEIS analysis area includes approximately 3.54 miles of road construction, 5.43 miles of road reconstruction, and 483 acres of ground disturbance (Table 2). The Alt V summary (Appendix A) contains additional small roads which are included in the footprint of the project features and will be superceded by the tailings impoundment, etc. These roads are not addressed in density calculations in the BA because the disturbed area was assumed to be lost habitat. The mitigation plan addresses the tailings pile and other footprint developments through the land acquisition plan (Wayne Johnson, Kootenai Biologist, pers. comm. 2000). There may be some minor road mile discrepancies between the BA and the Alt V summary (Attachment A) as a result. The complete description of Alt V is contained in the ASARCO Rock Creek Environmental Impact Statement (Montana Department of Environmental Quality and U.S. Forest Service 1995) and the subsequent SEIS (Montana Department of Enviromental Quality and U.S. Forest Service 1998) and is part of the administrative record contained in the Service's Montana Field Office, Helena, Montana.

Table 2. The Proposed Surface Disturbance and Associated Features with the Sterling Rock Creek Project.

PROJECT FEATURE	AREA (ACRES)
EIS.SEIS Analysis Area (Percent treated)	198,394 (0.8 percent)
Hard Rock Mine Permit Area	1,560**
Total Area of Surface Disturbance	483
Tailings Impoundment*	368
Mill Site*	41
Exploration Adit & Support Facilities	10
Roads	64
Total Road Construction/Reconstruction	8.97 miles
Road Construction	3.54 miles
Road Reconstruction	5.43 miles

* The estimated surface disturbance includes all the features associated with the tailings impoundment and mill site.
** Corrected permit area acres from Kathy Johnson, Montana Department of Environmental Quality, December 2000.
From Appendix A, Alt V description.

The four following roads have been identified for road closure as part of mitigation in the proposal (Unnumbered Figure on page 60 of BA):

1. 2285, Orr Creek, Closed for 1.61 miles year-long with a barrier.

2. 2741X, unnamed road, closed for 0.18 miles year-long with a barrier.

3. 150, Rock Creek, closed for 2.92 miles year-long with a gate. The north 0.42 miles will be obliterated and the south 2.5 miles will be gated.

4. 2741A, unnamed road, closed for 0.47 miles year-long with a barrier.

<u>Grizzly Bear Conservation Measures</u>

The Rock Creek Project, as proposed by the Kootenai, includes a suite of conservation measures and mitigation plans (Appendix C) developed during the informal consultation period and through the public National Environmental Policy Act (NEPA) review process. The Rock Creek Project analyzed in this biological opinion incorporates the full measure of the mitigation plan as a successfully- implemented and integral part of the Rock Creek project proposal. Any changes that result from changes in the mitigation plan, or other contingency plans that change the assumptions in the BA may be the basis for reconsultation. Conservation measures were designed to reduce adverse affects to fish, wildlife, water and air quality, reduce noise, improve human safety, and reduce impacts associated with the Project. Conservation measures most relevant to reducing impacts on grizzly bears include managing access, providing seasonally important habitats, and education/law enforcement to reduce mortality risks. Mortality risk would be reduced by minimizing the potential to attract bears to areas where they would be vulnerable by—(1) avoiding the use of preferred vegetative forage like clover (*Trifolium spp*.) to reclaim disturbed sites from construction facilities and roads, (2) avoiding the use of salt when sanding during winter plowing operations on FDR - 50, (3) using bear- resistant containers for human food/waste, and (4) removing the remains of road-killed carcasses along roads.

The BA identifies a maximum of 7,044 acres that will be directly influenced by the mine or its activities (assuming .25 to .5 mile of physically disturbed sites and human travel routes) at some time during the mine's development and operation. Direct surface disturbance will affect 483 acres. The proposed mitigation plan requires replacement habitat. A total of 2,350 acres of on-or off-site habitat would be selected as available. On-site habitat for the direct surface disturbance would be that occurring in the directly-affected BAAs within BMUs 4, 5, or 6. Off-site habitat would be other lands within the Cabinet portion of the Cabinet/Yaak Ecosystem (CYE) but outside those affected BAAs. The habitat replacement program would secure the minimum 2,350 acres with an average of 2.11 habitat units/acre prior to the beginning of operations. Approximately 1,219 acres would be secured prior to the construction period and the remaining to be acquired prior to production. This was designed to insure that adequate habitat quality and quantity would be secured to minimize the effects of the Rock Creek Project during construction, operation, and reclamation. An additional 100 acres of on-site mitigation is required to mitigate for habitat constriction within the north to south movement corridor in the Cabinet Mountains (BA page 23) within the BMUs 4, 5, and 6.

The mitigation plan also included 484 acres of habitat enhancement to be located within Bear Management Unit (BMU) 4, 5, or 6 to improve habitat conditions for grizzly bears. The 484 acres were required in the mitigation plan to improve habitat conditions through road closures, burns or other projects on existing or acquired lands within BMUs 4, 5, and 6. Sterling would fund habitat enhancement, commensurate with loss of habitat effectiveness. Enhancements include, but are not limited to, prescribed fire to restore whitebark pine, road closures and obliterations. Enhancements are preferred in the affected BMU. However, if opportunities are not available, then work may be done in adjacent BMUs.

The 1998 BA stated that mitigation acres would be acquired through acquisition, which would be transferred to the U.S. Forest Service (USFS), or fee conservation agreement for the 35+ year-life of the mine plus two bear generations, or approximately 50 years, thereafter to be kept in Sterling management. Table 3 shows the scheduled mitigation.

"In kind" replacement habitat for the habitat lost to physical disturbance such as the mine facilities, was built into the mitigation plan, even though some of the disturbance is MS-3 habitat and some is on private land. The direct and indirect effects upon grizzly bears and their habitat from noise and equipment disturbance and physical alteration led to a proposal to replace a minimum of 2,350 acres of "in kind" habitat in the Conservation Measures. "In kind" mitigation is based upon a minimum of 6,133.5 early season habitat units and 3,783.5 late season habitat units (a minimum total of 4,958.5 combined early and late season habitat units with an average of 2.11 habitat units/acre). These habitat units would be secured using fee title acquisitions and/or conservation easements on existing private lands. All fee title and easement lands were proposed to be maintained and managed by Sterling throughout the operation period (35 years) and for a reasonable period of time after completion of reclamation to insure the lands directly affected by the Rock Creek Project return to suitable habitat for grizzly bears. Fee title lands would then be deeded to the Kootenai. The habitat unit calculation method is on file at the Kootenai.

Table 3. Mitigation Acres

ACTIVITY AREA	REPLACEMENT ACRES	TIMING
Exploration Adit	53	Prior to Construction
Tailings & Associated Features	806	Prior to Construction
Mill & Associated Features	248	Prior to Construction
Ventilation Adit	10	Prior to Construction
New Roads	102	Prior to Construction
Existing Roads (Reconstruction)	565	Prior to Reconstruction
Existing Roads (Increased Influence)	566	Prior to Operations
Total Alternative 5	2,350	Prior to Operations

This schedule will have all replacement habitat (except the wilderness ventilation adit) in place prior to starting full operations (end of year 5).

Either fee title or conservation easements are acceptable under the mitigation plan. Either method must be, at a minimum, for the life of the mine (35 years) plus a reasonable recovery period following mine reclamation. Bear generations are between 7 and 10 years (Wayne Kasworm, Service Biologist, pers. comm.) and a 'reasonable' period is defined in the BA as two bear generations, or about 50 years. Fee title lands would be turned over to the USFS. First choice for replacement habitat is within the disturbed BAAs, considered to be on-site habitat for the direct impacts. If adequate replacement acres are not available in those BAAs, then acres may be found in other BAAs within the BMUs in the southern portion of the Cabinet Mountains.

Mortality risk also would be reduced by minimizing human/bear confrontations through:

1. Sterling funding an Information and Education Officer position under the Montana Fish, Wildlife, and Parks to educate people about bear behavior and how to reduce the potential for grizzly bear conflicts;

2. Sterling developing a transportation plan to minimize vehicular traffic associated with the mine;

3. Sterling enacting restrictions against feeding wildlife; and,

4. The Kootenai managing access in the affected BMUs to offset increases in access densities associated with the Rock Creek Project.

5. Minimizing illegal or accidental mortality through company restrictions imposed by Sterling to prevent employees from carrying firearms on the permit area and funding a Montana Fish, Wildlife, and Parks position (in addition to the Information and Education Officer position) to conduct law enforcement investigations of human-induced bear mortality and to deter illegal behavior.

Several habitat protection and enhancement measures already mentioned also are part of the Project proposal. These include:

1. Sterling funding the securing and/or protecting of 2,350 acres during the construction and operation of the Project through fee title acquisitions or easements,

2. Sterling funding habitat enhancement measures on 484 acres in the affected BMUs, and

3. Protecting spatial and seasonal habitat components important in maintaining connectivity between the northern and southern portions of the CYE through Federal acquisition or conservation agreements.

The proposed mitigation plan requires Sterling to either establish a trust fund or post a bond prior to implementation of the Project to insure full implementation of the Conservation plan. Sterling would make four deposits over 15 years and would be recalculated to address the appropriate dollar amounts at the time.

<u>Bull Trout Conservation Measures</u>

This proposed action includes the future refinement and approval of monitoring and mitigation plans for bull trout by Sterling, in concert with the MDEQ, Kootenai, and the Service. Appendix H of the DEIS contains a complete description of the monitoring and mitigation plans developed by MDEQ and Kootenai.

The regulatory agencies will address the refinement and review of the monitoring plans as an interagency team. Not all of the plans listed in Appendix H of the DEIS directly affect the fishery; however, if they do, it is important to review the relevant plans and provide input from a fisheries perspective to ensure impacts to bull trout are minimized. The Service will participate as needed; however, we expect that the Forest Fishery Biologist, Forest Hydrologist, Forest Geologist, and Forest Soil Scientist will be involved in issues related to water use, fishery monitoring plans, sediment abatement plans and monitoring, and groundwater issues.

Monitoring and mitigation plans to be refined, approved and ultimately included in the plan of operations (as outlined in Appendix H of the DEIS) include:

Air Quality Monitoring
Rock Mechanics Monitoring
Acid Rock Drainage and Metals Leaching Plan
Evaluation Adit Data Evaluation Plan
Tailings Paste Facility and Tailings Surry Line Construction Monitoring Plan
Soils and Erosion Control Plan
Reclamation Monitoring Plan
Water Resources Monitoring Plan
Influent and Effluent Monitoring Plan
Monitoring of Biological Oxygen Demand Plan
Wildlife Mitigation and Monitoring Plan
Threatened and Endangered Species Mitigation Plan
Aquatics and Fisheries Monitoring and Mitigation Plan
Hard Rock Mining Impact Plan
Wetlands Mitigation Plan

From this point forward, this biological opinion, for convenience and ease of interpretation, is separated into two Parts—Part A includes the grizzly bear and Part B includes the bull trout.

PART A - GRIZZLY BEAR

BACKGROUND

The Service provided a non-jeopardy opinion to the Kootenai on June 26, 1985 (U.S. Fish and Wildlife Service 1985) on the Kootenai National Forest Plan (Forest Plan) which was finalized in 1987 (U.S. Forest Service 1987). A change in Act regulations in 1987 precipitated an amended biological opinion on the Forest Plan on July 27, 1995 (U.S. Fish and Wildlife Service 1995). The amended biological opinion included an incidental take statement for grizzly bears which incorporated recommendations of the Interagency Grizzly Bear Committee (IGBC) Taskforce (1994) and research on access impacts on grizzly bears. The Incidental Take Statement for the Forest Plan, hereafter referred to as the ITS, specified that access requirements be applied within the recovery zone.

The IGBC is comprised of representatives from the USFS Regions 1, 2, 4 and 6; Regions 1 and 6 of the Service; the States of Montana, Wyoming, Idaho, and Washington; the province of British Columbia in Canada; and the U.S. National Park Service Intermountain Region. The IGBC coordinates a unified approach to grizzly bear recovery within established recovery zones. Recovery zones are divided into smaller areas called BMUs to facilitate population monitoring and habitat evaluation within each ecosystem. The BMUs approximate the average home range of a female grizzly (100 square miles) to assist in characterizing grizzly bear numbers and distribution within each ecosystem and in tracking cumulative effects (U.S. Forest Service and others 1988). The Kootenai divided the BMUs into smaller areas (approximately 5,000 to 15,000 acres) called Bear Analysis Areas (BAAs), which are used for various analyses.

The guidelines for Management Situations (MS-1, MS-2, and MS-3) are as follows (from IGBC Guidelines, U.S. Forest Service 1986):

1. The MS-1 lands are those that contain grizzly population centers and/or habitat that is needed for the survival and recovery of the species. The needs of the grizzly bear will be given priority over other management considerations. Land uses which can affect grizzly bears and/or their habitat will be made compatible with grizzly needs or such uses will be disallowed or eliminated.

2. The MS-2 lands are those areas that lack distinct population centers and the need for this habitat for survival of the grizzly bear is more uncertain. The status of such areas is subject to review. Here, management will at least maintain those habitat conditions that resulted in the area being classified as MS-2. The Kootenai no longer has MS-2 lands.

3. The MS-3 designation is intended for lands where grizzly bears may occur infrequently, but human developments such as campgrounds or resorts may result in conditions that make grizzly presence untenable for humans and/or grizzly bears. There is high probability that Federal activities here may affect the species survival and recovery. Management focus is on human-bear conflict minimization rather than habitat maintenance and protection.

The Service believes that excessive road densities are among the most serious of adverse impacts on grizzly bears, especially when located near human settlements or populations. Road impacts associated with resource management have been incorporated in the Forest Plan and the ITS. Negative impacts associated with roads and excessive road densities influenced grizzly bear population and habitat use patterns in numerous, widespread areas. The Grizzly Bear Compendium (Interagency Grizzly Bear Committee 1987) summarized impacts reported in the literature including:

1. Avoidance/displacement of grizzly bears away from roads and road activity;

2. Changes in grizzly bear behavior, especially habituation, due to ongoing contact with roads and human activities conducted along roads;

3. Habitat loss, modification, and fragmentation due to roads and road construction, including vegetative and topographic disturbances; and

4. Direct mortality from road kills, legal and illegal harvest, and other factors resulting from increased human-bear encounters.

Grizzly bear mortalities are a serious consequence of roads in grizzly habitat. Mortalities result directly from illegal shooting, or more indirectly, through habituation. Continued exposure to human presence, activity, noise, etc., without negative consequences can result in habituation, the loss of a bear's natural wariness of humans. High forest road densities and associated increases in human access into grizzly bear habitat can lead to the habituation of grizzly bears to humans. Habituation in turn increases the potential for conflicts between people and bears. Habituated grizzly bears often obtain human food or garbage and become involved in nuisance bear incidents, and/or threaten human life or property. Such bears generally experience high mortality rates; they are eventually destroyed or removed from the population through management actions, or are more vulnerable to illegal killing because of their increased exposure to people. In the Yellowstone region, people killed habituated bears over three times as often than non-habituated bears (Mattson et al. 1992).

The specific relationship between roads and mortality risk to grizzly bears is difficult to quantify. Research has supported the general premise that forest roads facilitated human access into grizzly bear habitat, which in turn directly or indirectly increased mortality risk to bears. Grizzly bears experienced increased vulnerability to illegal and legal harvest as a consequence of increased road access by humans in Montana (Mace et al. 1996) and in the Yellowstone region (Mattson et al. 1992). In southeastern British Columbia, McLellen and Shackleton (1988) reported that roads increased access for legal hunters and poachers, the major source of adult grizzly mortality. McLellen and Mace (1985) found that a disproportionate number of mortalities occurred near roads. In the Yellowstone ecosystem, Mattson and Knight (1991) reported that areas influenced by secondary roads and major developments were most lethal to bears. Aune and Kasworm (1989) reported 63 percent of known human-caused grizzly deaths on the east front of the Rocky Mountains occurred within 1 kilometer (0.6 miles) of roads, including 10 of 11 known female grizzly deaths. In Montana, Dood et al. (1986) reported that 48 percent of all known, nonhunting mortalities during 1967-1986 occurred within 1 mile of roads.

The level of human use of roads is one of several factors influencing the mortality risk associated with any road. Known, human-caused grizzly bear mortality in the South Fork Study area during the 6-year period of 1988-1994 appeared relatively high when compared to other studies. During a 9-year period of research in southeastern British Columbia, McLellen (1989) reported fewer human-caused grizzly bear mortalities (11) than occurred during 6 years of research in the South Fork Study area (13) (excluding legal hunter and research-caused mortalities). Although the British Columbia study area was roaded for gas exploration, timber harvest, and other uses, the area had few permanent human residents and generally received lower use by humans than did the South Fork Study area in Montana.

This comparison illustrates that the presence of forest roads alone does not necessarily result in direct mortality of grizzly bears. The proximity of the forest to human population centers results in high numbers of people using forest roads. Dispersed recreation in habitat around roads poses considerable risks to grizzly bears. Social values and attitudes also contribute to the level of mortality risk to bears. Incidental or accidental human-caused grizzly bear mortality, along with even a few individuals intent on illegally shooting bears, can collectively result in serious, harmful effects on grizzly bear populations. Mortality risk generally increases as more people gain access into grizzly bear habitat. Access management can be instrumental to reducing mortality risk to grizzly bears by managing the present and anticipated future road use-levels associated with timber harvesting and as a result of an increasing human population.

Research has not yet quantified all of the factors contributing to direct links between roads and displacement of grizzly bears from habitat. However, research indicated that grizzly bears consistently were displaced from roads and the habitat surrounding roads (Mattson et al. 1987; McLellen and Shackleton 1988; Aune and Kasworm 1989; Kasworm and Manley 1990; Mace et al. 1996; Mace and et al. 1999). In the Rocky Mountain Front region, Aune and Stivers (1982) reported that grizzly bears avoided roads and surrounding corridors even when the area contained preferred habitat for breeding, feeding, shelter, and reproduction. McLellen and Shackleton (1988) found that grizzly bears used areas near roads less than expected in southeastern British Columbia and estimated that 8.7 percent of the total area was rendered incompatible for grizzly use because of roads. Mace et al. (1999 and 1996) found that as road densities and human use of roads increased in an area, female grizzly bear use of habitat decreased.

Mace and Manley (1993), studied the impacts of roads on bears and calculated a "precise" open and total road density for 31 radioed grizzly bears in the South Fork Flathead within the Northern Continental Divide Ecosystem (NCDE). The precise road density technique showed that closed roads had a significant influence of bear use and that the juxtaposition of open roads was more important than the average linear road density. Further, if only open roads were analyzed, closing roads had a positive effect on use of an area by grizzly bears when precise open road densities were reduced below 1 mile per square mile. In 1996, the final research paper on the effects of roads on grizzly bears in the South Fork study area was published (Mace et al. 1996). The paper further supported the concepts of open and total motorized access management as important for grizzly bear habitat conservation.

An IGBC taskforce on access was created at the request of the IGBC to evaluate procedures for analyzing the effects of motorized access on grizzly bears and to develop consistent, scientific analysis methods to be followed on public lands in grizzly bear ecosystems. The taskforce completed the IGBC Taskforce Report on Grizzly Bear/Motorized Access Management (Interagency Grizzly Bear Committee 1994). The taskforce reconvened in 1998 to incorporate the latest research and access monitoring techniques from the NCDE, CYE, the Selkirks, and Yellowstone Ecosystems (Interagency Grizzly Bear Committee 1998a). The objective was to provide a consistent approach to motorized access management between and within grizzly bear ecosystems, using three basic parameters—Open Motorized Route Density (OMRD), Total Motorized Route Density (TMRD), and "core" areas, where motorized use of roads or trails was not permitted.

Wakkinen and Kasworm (1997) used the IGBC recommended analysis techniques in the CYE and documented OMRDs of greater than one mile per square mile in 33 percent of an average female home ranges, and TMRDs of greater than 2 miles per mile square in 26 percent of an average female home range. They found that 55 percent of an average female home range was core habitat. The results may be an indication that CYE bears have more successfully adapted to these road densities, or may be partially an artifact of the existing road densities in the CYE.

A supplement to the 1998 taskforce report was prepared for each Subcommittee to address how taskforce recommendations would be applied with ecosystem specific information. The ITS for the Kootenai and the Lolo required their participation on the SCYE Subcommittee. The SCYE Subcommittee access taskforce developed an interim Access Management Rule Set (hereafter referred to as Rule Set) , approved by the SCYE Subcommittee on December 1, 1998. The Rule Set provides guidance on the implementation of the Forest Plan standards for grizzly bears, the requirements in the ITS, and application of new research information. The Rule Set further clarified definitions of habitat security, core, habitat quality/season of use, coordination with State game and fish agencies, motorized route density, provided guidance on annual monitoring schedules required by the ITS.

In 1995, the Service incorporated the results of grizzly bear access research done in the early 1990s and concluded that "harm" of grizzly bears is likely to occur when—(1) precise OMRD exceeded 1 mile/square mile in some proportion of a BMU, and (2) precise TMRD exceeded 2 miles/square mile in some proportion of a BMU, as calculated by moving windows. The Service further determined that the specific proportions of a BMU that could be affected by high road densities resulting in harm might depend on ecosystem-specific conditions. The Service recommended that information from each grizzly bear ecosystem be analyzed to determine the proportion of highly roaded habitat that results in incidental take through modification of habitat. The Service determined that high road densities resulted in the incidental take of grizzly bears on the Kootenai and developed an ITS for the Forest Plan.

The Lolo National Forest (Lolo) manages one of the 22 BMUs in the CYE. The biological opinion (U.S. Fish and Wildlife Service 1982) for the Lolo Forest Plan (U.S. Forest Service 1982) was similarly amended on May 24, 1996 (U. S. Fish and Wildlife Service 1996). The amended biological opinion provided the Lolo with an ITS that included reasonable and prudent measures and associated terms and conditions to reduce the take of grizzly bears resulting from motorized access and high use trails. Terms and conditions for the CYE portion of the Lolo were similar to those in the Forest Plan for the Kootenai portion of the CYE. The amended biological opinion concluded that the level of incidental take associated with road densities on the Lolo was not likely to jeopardize the continued existence of grizzly bears within the CYE. The Service's reasonable and prudent measures and terms and conditions stipulated participation in the development and implementation of CYE access guidelines through the combined Selkirk and Cabinet/Yaak Ecosystem (SCYE) Subcommittee access taskforce to minimize incidental take of grizzly bears. A similar ITS is being developed (as of December 2000) for the Idaho Panhandle National Forest (Panhandle), which manages all or parts of six BMUs in the CYE.

The ITS provided the Kootenai with reasonable and prudent measures and associated terms and conditions designed to reduce the take of grizzly bears resulting from road access. The ITS requires the Kootenai to comply with the following terms and conditions in order to be exempt from the prohibitions of Section 9 of the Act. Terms and conditions of the ITS as they affect the CYE portion of the Kootenai are summarized below:

1. Participate in the development of access recommendations regarding open roads and open motorized trails according to the SCYE Subcommittee Access group. Adopt and implement these recommendations within the CYE recovery zone.

2. Participate in the development of access recommendations regarding total motorized access routes according to the SCYE Subcommittee Access group. Adopt and implement these recommendations within the CYE recovery zone.

3. Participate in the development of access recommendations regarding core areas according to the SCYE Subcommittee Access group. Adopt the recommended percentage of core within BMUs in the Kootenai.

4. Changes in these levels can be made through the SCYE Access Subcommittee if approved by the IGBC subcommittee. If approved in writing by the Service, these approved changes will serve as amended terms and conditions. As of the date of this biological opinion, no changes to the amended terms and conditions have occurred.

5. Develop information for the public on the status of road management within 1 year of the ITS.

Participation in the SCYE subcommittee access taskforce resulted in the Rule Set, which the Service views as the guidelines for the Kootenai to comply with the ITS until final rules are developed. The interim period for the Rule Set was determined to be 3 years (from December 1998) until Forest Plans are revised or until the SCYE Subcommittee determines a need to modify the direction. During the interim period, the feasibility of using a Resource Selection Factor (RSF) (Mace et al. 1996) approach to core areas will be explored.

Research in the CYE indicated that 55 percent core was available in the average home range of successful female bears studied (Wakkinen and Kasworm 1997). No net loss of existing core is required in the ITS. The Kootenai is aware that the current baseline in some BMUs is not at the level found by research to support female bears and that no net loss would not improve these low levels. The Kootenai is working to improve habitat security through access management (Table 8) to the extent possible under their legislative requirements to provide access to private lands.

The ITS included terms and conditions to minimize the incidental take of grizzly bears resulting from access associated with the Forest Plan. The Environmental Baseline section of this biological opinion summarizes current Kootenai conditions with respect to the Forest Plan Standards and other assessment criterion and the terms and conditions. The Effects section addresses how the Rock Creek Project adheres to these requirements. The ITS required participation in the appropriate ecosystem Subcommittee access taskforce. The ITS has not established numerical standards for OMRD, TMRD, or core in the SCYE, but requires no degradation of these parameters as compared to baseline conditions at the time of the ITS, and encourages improvements to meet the levels indicated by research to be essential to bears (Wakkinen and Kasworm 1997). The Subcommittee access taskforce, of which both the Service and the Kootenai are members, continues to address concerns about habitat quality in secure bear habitat.

Action Area

The "action area" is defined as all the areas to be affected directly or indirectly by the Federal action, not merely the immediate area involved in the action (50 CFR § 402). The action area for the Rock Creek Project includes the southern portion of the Cabinet mountains in the CYE. It includes compartment 711 of the Cabinet Ranger District of the Kootenai in Sanders County, Montana. The project area begins approximately one air mile east of Noxon, Montana. Surface activities are planned along approximately three miles of Rock Creek and up the West Fork of Rock Creek. Subsurface mining is proposed to occur under the Cabinet Mountains Wilderness. The proposal includes the proposed acquisition, through purchase or conservation easement, of 2,350 acres of mitigation habitat plus 100 acres of on-site mitigation replacement habitat to help reduce the fragmentation of the northern and southern portions of the CYE. On-site habitat is defined as habitat within the affected BAAs.

The Rock Creek Project begins on the southwest edge of the CYE and much of the impact will occur on private patented land on the edge or outside of the recovery zone. Specific locations of the replacement mitigation habitat has not yet been identified, but would occur on-site within the three BMUs directly affected by the project, BMU 4, 5 or 6, or would occur off-site in BMUs outside the area directly affected by the project but within the CYE recovery zone. The project is located near and influences streams or rivers and other water bodies inhabited by the threatened bull trout (*Salvelinus confluentus*).

STATUS OF THE SPECIES/CRITICAL HABITAT

A. Species Description

The grizzly bear was classified as threatened under provisions of the Act on July 28, 1975 (40 FR 31736). The Service identified the following as factors establishing the need to list--
(1) present or threatened destruction, modification, or curtailment of habitat or range;
(2) overutilization for commercial, sporting, scientific, or educational purposes; and (3) other manmade factors affecting its continued existence. No critical habitat has been delineated for grizzly bears.

In 1991, the Service received petitions to reclassify the five existing grizzly bear populations (Yellowstone, Northern Continental Divide, Cabinet-Yaak, Selkirk, and North Cascades) (Figure 2) from threatened to endangered. On April 20, 1992, the Service issued a "not warranted for reclassification" finding for the Yellowstone and Northern Continental Divide populations (57 FR 14372). The Service issued a 12 month finding of warranted but precluded for the CYE and not warranted for the Selkirk ecosystem on February 12, 1993 (58 FR 8250-8251), hereafter referred to as the 1993 finding. On May 17, 1999, the 12-month finding on petitions to change the status of grizzly bear populations in the Selkirk area in Idaho and Washington and the Cabinet Yaak area of Montana and Idaho from threatened to endangered, hereafter referred to as the 1999 finding, documented that reclassification of grizzly bears in the Selkirk Ecosystems from threatened to endangered was warranted but precluded by work on higher priority species (64 FR 26725). The 1999 finding also reported data that indicated these two populations may be connected through Canada. The Service will consider formally recognizing a distinct population segment that would encompass both of these ecosystems in the future. Until a final determination is made on a distinct population segment, the Service will treat the ecosystems as separate. Until reclassification occurs, both the CYE and Selkirk populations will continue to be managed as threatened.

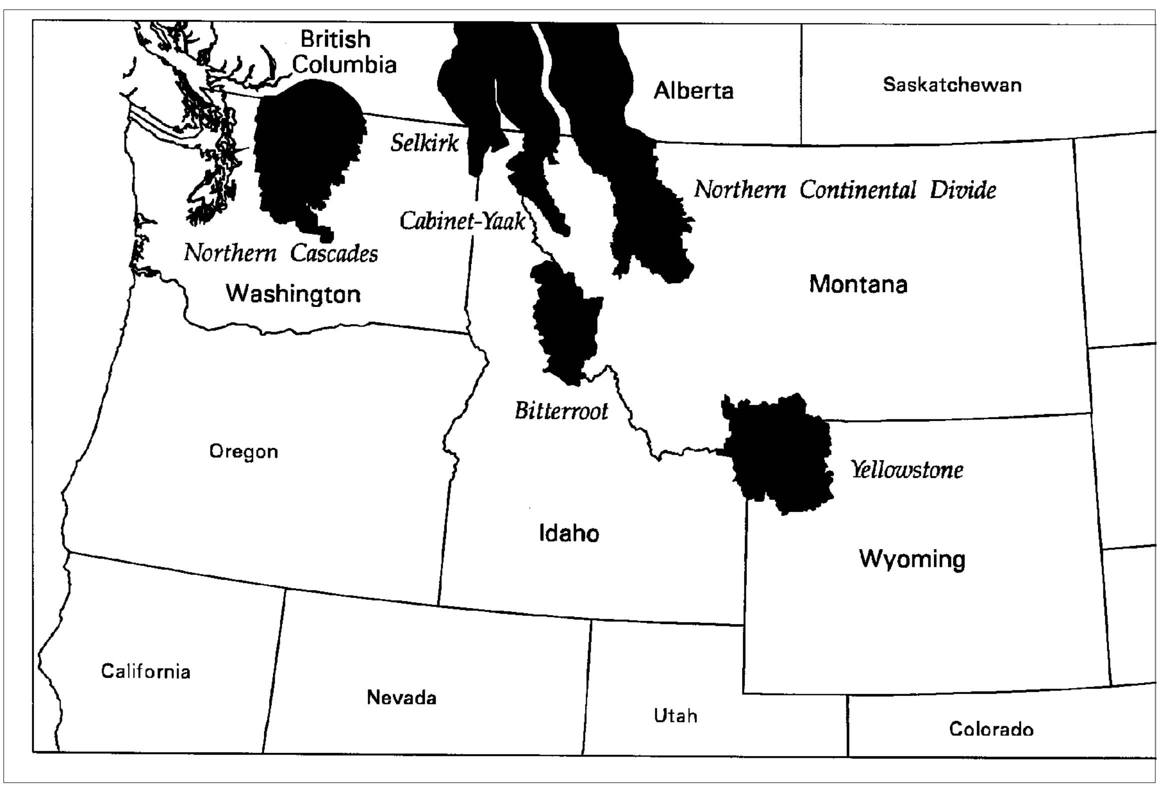


Figure 2. Grizzly bear recovery areas in the U.S. and southern British Columbia and Alberta, Canada.

B. Life history

The following information is abridged from the Grizzly Bear Recovery Plan (Recovery Plan) (U.S. Fish and Wildlife Service 1993). More specific information can be obtained in that document. Grizzly bears are among the largest terrestrial mammals in North America. South of the United States - Canada border, adult females range from 250-350 pounds and adult males range from 400 to 600 pounds. Grizzly bears are relatively long-lived; individuals in the wild may live 25 years or longer. Grizzlies are omnivorous, opportunistic feeders that require foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive seasonal pre-and post-denning requirements. Grizzly bears are homeo-hypothermic hibernators, meaning their body temperature drops no more than 5° C (approximately 10° F) during winter when deep snow, low food availability, and low ambient air temperatures appear to make winter sleep essential to grizzly bears' survival (Craighead and Craighead 1972a, 1972b). Grizzly bears excavate dens and require environments well-covered with a blanket of snow for up to 5 months, generally beginning in fall (September-November) and extending until spring (March-April) (Craighead and Craighead 1972b; Pearson 1975).

The search for energy-rich food appears to be a driving force in grizzly bear behavior, habitat selection and intra/inter-specific interactions. Grizzlies historically used a wide variety of habitats across the North America, from open to forested, temperate through alpine and arctic habitats, once occurring as far south as Mexico. They are highly dependent upon learned food locations within their home ranges. Adequate nutritional quality and quantity are important factors for successful reproduction. Diverse structural stages that support wide varieties of nourishing plants and animals are necessary for meeting the high energy demands of these large animals. Grizzly bears follow phenological vegetative, tuber or fruit development, would seek out concentrated food sources including carrion, live prey (fish, mammals, insects), and are easily attracted to human food sources including gardens, grain, compost, bird seed, livestock, hunter gut piles, bait, and garbage. Bears that lose their natural fear and avoidance of humans, usually as a result of food rewards, become habituated, and may become food-conditioned. Grizzly bears will defend food and have been known to charge when surprised. Both habituation and food conditioning increase chances of human-caused grizzly bear mortality as a result of real or perceived threats to human safety or property. Nuisance grizzly bear mortalities can be a result of legal management actions, defense of human life, or illegal killing.

Adult grizzly bears are individualistic and normally solitary, except females with cubs, or during short breeding relationships. They will tolerate other grizzly bears at closer distances when food sources are concentrated, and siblings may associate for several years following weaning (Murie 1944, 1962; Jonkel and Cowan 1971; Craighead 1976; Egbert and Stokes 1976; Glenn et al. 1976; Herrero 1978). Across their range, home range sizes vary from about 50 square miles or more for females to several hundred square miles for males, and overlap of home ranges is common. Grizzlies may have one of the lowest reproductive rates among terrestrial mammals, resulting primarily from the late age at first reproduction, small average litter size, and the long interval between litters. Mating occurs from late May through mid-July. Females in estrus will accept more than one adult male (Hornocker 1962), and can produce cubs from different fathers the same year (Craighead et al. 1995). Age of first reproduction and litter size may be nutritionally related (Herrero 1978; Russell et al. 1978). Average age at first reproduction in the lower 48 States for females is 5.5 years, and litter size ranges from 1 to 4 cubs who stay with the mother up to 2 years. Males may reach physiological reproductive age at 4.5, but may not be behaviorally reproductive due to other dominant males preventing mating.

Natural mortality is known to occur from intra-specific predation, but the degree this occurs in natural populations is not known. Parasites and disease do not appear to be a significant cause of natural mortality (Jonkel and Cowan 1971; Kistchinskii 1972; Mundy and Flook 1973; Rogers and Rogers 1976). As animals highly dependent upon learned habitat, displacement into unknown territory (such as subadult dispersal) may lead to submarginal nutrition, reduced reproduction or greater exposure to adult predatory bears or human food sources (which can lead to human-caused mortality). Starvation and loss in dens during food shortages have been surmised, but have not been documented as a major mortality factor. Natural mortality in rare, relatively secretive animals such as grizzlies can be extremely difficult to document or quantify.

Human-caused mortality has been slightly better quantified, but recent models speculate that reported mortality may be up to 50 percent of actual mortality (McLellen et al. 1999). Between 1800 and 1975, grizzly populations in the lower 48 states have declined drastically. Fur trapping, mining, ranching, and farming pushed westward, altering habitat and resulted in the direct killing of grizzly bears. Grizzly bears historically were targeted in predator control programs in the 1930s. Predator control was probably responsible for extirpation in many states that no longer support grizzlies. The legal grizzly bear hunting season in Montana was closed in 1991. More recent human-caused mortality includes management control actions, defense of life, defense of property, mistaken identity by black bear or other big game hunters, poaching, and malicious killing.

Grizzly bears normally avoid people, possibly as a result of many generations of bear sport hunting and human-caused mortality. Displacement away from human activities has been documented to reduce fitness of grizzly bears, affecting survival in some instances. Avoidance of roads can lead grizzly bears to either avoid essential habitat along roads, or could put them at greater risk of exposure to human-caused mortality if they do not avoid roads.

Other research, not addressed in the Recovery Plan, document grizzly bear response to disturbances other than roads, such as mining, seismic activity and aircraft has been documented, and is usually related to displacement away from the activity. Individual bear behavior, season of use, sex, habitat conditions and a wide variety of other factors muddy the analysis. McLellen and Schackleton (1988) found no significant displacement, in terms of moving away from the disturbance, when radio monitored bears were exposed to seismic activities, gas exploration and timber harvest, although individual bears responded differently. They did document avoidance of roads (McLellen and Shackleton 1988) and industrial sites (McLellen and Shackleton 1989). (See discussion of roads under Effects section of this biological opinion).

Bears responded differently to people on foot, to moving vehicles and to fixed wing aircraft in open habitat versus timbered habitat (McLellen and Shackleton 1989). The greatest reactions were to humans on foot or in moving vehicles in remote areas in open habitat. Bears closer to human development (McLellen and Shackleton 1989) or in Glacier National Park where Jope (1986) suggested bears in parks habituate to high human use and showed less displacement–even in open habitats. In their Canadian study area, McLellen and Shackleton (1989) found that bears near roads were more vulnerable to hunting, which is legal in Canada, and found some support for the hypothesis that non-secretive bears are eliminated from the population by hunters.

Observable displacement away from disturbance may not be the only reaction of bears to disturbance. Anectdotal information regarding disturbance to bears around den sites has been reported. Reynolds et al. (1984) reported elevated heart rates in one bear when a seismic shot detonated 1.4 km from its den and another responded from a shot 1.6 km from its den. When seismic crews ventured within 1 km of the dens, bear heart rates rose, but low sample size was not adequate to indicate whether the raised heart rate was a response to the activity. Schoen et al. 1987 noted some movement when fixed-wing aircraft flew within 150 meters above den sites, but Reynolds noted that heart rates of two monitored bears did not change during flights. Harding and Nagy (1977) found that grizzly bears denned successfully 1.6 to 6.4 km from active mining camps, and appeared to avoid drilling and staging camps by at least 1 km. Swenson (1997) considered that fall hunting in Sweden early in the denning season contributed to fall disturbance of brown bears. They suggested that denning bears may be more tolerant of industrial activity than humans or human activity such as hunting, survey work, shooting, fishing and a dog near the den site.

C. Current Status and Distribution

In the conterminous 48 States, the Cabinet-Yaak Ecosystem (CYE) and five other areas in mountainous ecosystems of Washington, Idaho, and Montana currently contain either self-perpetuating or remnant populations of grizzly bears, or have been identified for grizzly bear recovery (U.S. Fish and Wildlife Service 1993). The Recovery Plan established recovery zones for the grizzly bear in each grizzly bear ecosystem. Recovery zones are areas large enough and of sufficient habitat quality to support a recovered bear population, and are the areas within which the population and habitat criteria for achievement of recovery will be measured. The Recovery Plan details recovery objectives for recovery zones within each of the following grizzly bear ecosystems where grizzly bear populations persist: the CYE, NCDE, Yellowstone, and Selkirk Ecosystems. There also is a small population in the North Cascades covered as an appendix to the Recovery Plan. The estimated total population of grizzly bears in the conterminous U.S. at the time of listing was 800 to 1,000 individuals (U.S. Fish and Wildlife Service 1993). There have been increases in the ecosystems since listing, primarily in the Yellowstone and Northern Continental Divide Ecosystems.

The nature of grizzly bears and the rugged terrain they inhabit makes census difficult. The Recovery Plan relies on more measurable parameters with which to assess population status in regards to recovery: number of females with cubs, the distribution of family groups, and the relationship between the minimum population estimate and known, human-caused grizzly bear mortality.

Recovery plan parameters are dependent upon reported observations, which are not consistent from year to year. Sightability and differences in individual bear behavior also render population estimates, using females with cubs, potentially variable from year to year. The minimum population estimate is very conservative by design and is not designed as a population trend estimate. It does provide a conservative estimate of population parameters that, if met for the period of time indicated, an indication of the recovery of the population. The Service believes the underlying data used to generate this estimate (i.e., females with cubs), in conjunction with the other Recovery Plan parameters, reliably and accurately reflects the status of the population at a given point in time.

Other Ecosystems

The Yellowstone Grizzly Bear Ecosystem (YGBE) Recovery Plan parameters are generally positive and several recovery parameters have been met. The best information suggests the YGBE grizzly bear population is stable and is likely increasing. The long term conservation of the population continues to depend largely on managing bear-human conflict, which often results in human-caused mortality of grizzly bears.

In the NCDE, results from monitoring grizzly bears during 1987 through 1996 indicate the Recovery Plan criteria for several population recovery parameters were met, including--
(1) numbers of females with cubs, (2) numbers of BMUs with family groups, (3) occupancy requirements for BMUs, and (4) total human-caused grizzly bear mortality. Female grizzly bear mortality exceeded recovery criteria limits through 1993, and again during 1997-1999.

The Selkirk Ecosystem grizzly bear population has not met Recovery Plan objectives. The Selkirk Ecosystem Recovery Plan criteria requires the observation at least six distinct females with cubs (over a 6-year average) for recovery. The Recovery Plan human-caused annual mortality limit (averaged over a 6-year period) for the ecosystem is no more than 0.4 bears, but the 6-year average was 1.33 bears. The human-caused female mortality limit is 0.12 bears measured over 6 years, but in 1999 the average over the past 6 years was 0.17. The Recovery Plan calls for seven of ten BMUs be occupied by females with young over a 6-year period, but four BMUs were occupied at least once in the period from 1994 and 1999 (Wakkinen and Johnson, 2000).

Grizzly bear population trend analyses were conducted in the early 1990s for the Selkirks Ecosystem, CYE, and the NCDE (Servheen et al. 1994). In 1993, the CYE grizzly bear population was found warranted for endangered status, but precluded by other listing priorities (58 FR 8250-8251). The Service found that grizzly bears in the CYE ecosystem warranted endangered status due to the small size of the population, and increasing human demands, logging, recreation and road-building. However, we also found that further processing of the petition and reclassification of the species was precluded by other listing activities.

Population parameters and lambda were re-calculated in 1999 for the CYE when the Selkirk population was re-evaluated (64 FR 26725). In the Service’s 1999 finding, research indicated a slight increase in lambda for the CYE and Selkirks, but wide confidence intervals that span

1.0 suggested those population trends should be cautiously evaluated. The 1999 finding also suggested that the Selkirk and CYE populations might be inter-connected, but until the Service revises the classification, bears in the Selkirk ecosystem will remain officially listed as threatened and considered a separate population from the CYE. Biological information described in the 1999 finding is utilized in this opinion since it is the best available information regarding bears in the CYE.

Grizzly bear recovery efforts in the Bitterroots Ecosystem and North Cascades Ecosystem are in the planning stages. In the North Cascades Ecosystem, most of the grizzly bear population occurs north of the Canada - United States border, but a few grizzlies persist south of the border. Grizzly bears were eliminated from the Bitterroot Ecosystem decades ago; however, suitable habitat occurs. A FEIS and ROD have been released selecting reintroduction of bears with a citizen management committee as the preferred alternative (U.S. Fish and Wildlife Service 2000).

ENVIRONMENTAL BASELINE

Regulations implementing section 7 of the Act define the environmental baseline as the past and present impacts of all Federal, State or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress. In this Rock Creek Project biological opinion, such actions include ongoing timber sales, Montanore, other patented and unpatented mining claims in the action area, existing roads and trails, and other human uses of the southern Cabinet Mountains.

The environmental baseline for this biological opinion includes four primary sections. The Status of Grizzly Bears in the CYE section documents population estimates, population trends and mortality in terms of Recovery Plan parameters and other population methods that have been applied to the CYE population. The Habitat-Forest Plan Standards and Associated Assessment Criterion section addresses the current parameters of habitat effectiveness, linear open road density, openings and displacement habitat that were addressed by Forest Plan standards or associated assessment criterion and the BA. The Habitat-ITS section addresses the current habitat conditions as related to the terms and conditions of the ITS. The Other Factors section addresses ongoing activities within the CYE that may influence the breeding, feeding, and sheltering of grizzly bears and other situations associated with this project such as sanitation or human development, that might have impacts on bears beyond those anticipated in the Forest Plan or the ITS.

The effects portion carries forward these topics and expands upon information provided under life history to predict how changes in the baseline parameters may affect bears throughout the life of the proposed project. The effects chapter also explains how these parameters are important in analyzing the potential of jeopardy to the CYE grizzly bear population and the impacts to grizzly bears resulting from these effects a summarized in terms of Displacement from Essential Habitat; Habituation/Food Conditioning Leading to Increased Mortality Risks; and Habitat Loss/Fragmentation.

Status of Grizzly Bears in the Cabinet/Yaak Ecosystem

The Rock Creek Project occurs in the CYE. The CYE includes portions of Montana and Idaho (Figure 3). The Federal land portion is managed by three National Forests (Kootenai, Lolo, Panhandle). The Recovery Plan stated that the CYE Recovery Zone encompasses approximately 2,600 square miles (1,664,000 acres) and is located in northwest Montana and northeast Idaho (U.S. Fish and Wildlife Service 1993). The CYE Recovery Zone is bordered to the north by the Canadian border, to the south by the Clark Fork River and Montana Highway 200, to the west by the towns of Moyie Springs and Clark Fork, and to the east by the town of Libby, and is bisected by the Kootenai River. The Kootenai classified private non-corporate land and all lands within .25 mile of private lands along Montana State Highway 200 as Management Situation 3. The following CYE Recovery Zone description is summarized from Kasworm et al. 2000.

Land ownership within the CYE Recovery Zone is approximately 90 percent Federal, 5 percent State, and 5 percent private lands (1999 finding). Primary private land owner in the CYE Recovery Zone is the Plum Creek Timber Company, Inc. (Plum Creek). A land exchange between the Kootenai and Plum Creek was finalized in 1997, which transferred approximately 21,422 acres to Federal ownership primarily within the CYE (1999 finding). Individual landowners live on various-sized acreage along the major rivers and there are numerous patented mining claims along the Cabinet Mountains Area. The Cabinet Mountains Wilderness area is approximately 34 miles long and varies from 0.5 to 7 miles wide and covers 94,272 acres of higher elevation habitat near the center of the Kootenai.

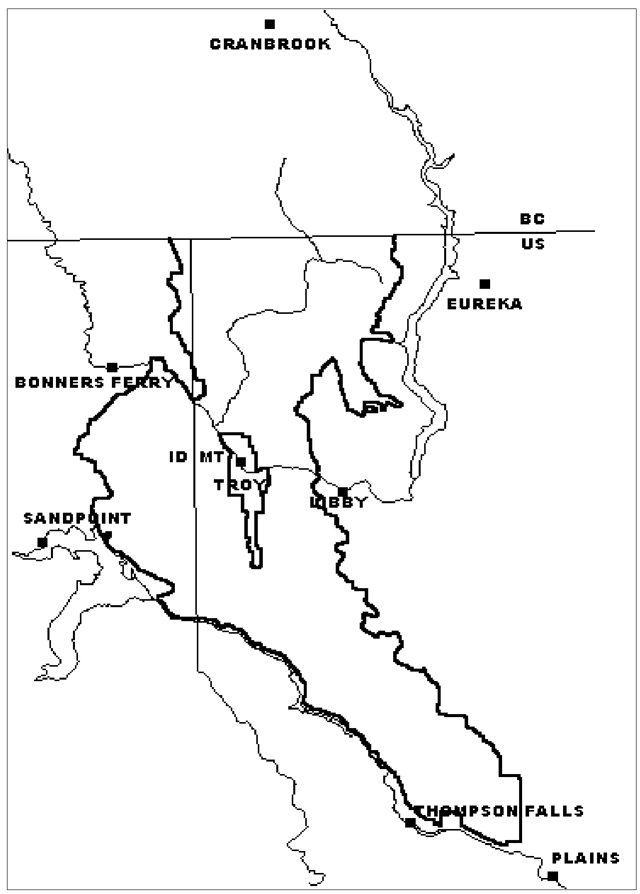


Figure 3. Cabinet-Yaak grizzly bear recovery zone.

The CYE has two different segments. The Cabinet portion is the southern half of the CYE, covering approximately 978,000 acres, and is topographically diverse, with a steep mountain range up to 8,700 feet near the center and more definable seasonal habitats. It is connected with the northern Yaak portion of the CYE by two corridors approximately 7.5 miles wide, separated by a section of private land where the town of Troy is located. The Yaak portion, covering the remaining portion of the CYE borders Canada. It has a gentler topography and slightly lower elevations, up to 7,700 feet, but seasonal habitats are not as clearly definable. More research and telemetry has occurred in the Yaak portion. The project occurs in the Cabinet portion of the CYE, along the south east edge of the recovery zone. About 15-20 grizzly bear observations have been recorded across the Clark Fork River to the south east of this area (Wayne Kasworm pers. comm. 2000), but land south of the Clark Fork River is not included within the recovery zone (Recovery Plan).

The exact size of the grizzly bear population in the CYE is unknown. There are 22 BMUs established in the CYE recovery zone. The Kootenai solely manages 15, 2 BMUs are managed jointly by the Kootenai and the Idaho Panhandle National Forest, the Lolo National Forest manages 1 of them, and the Idaho Panhandle National Forest solely manages 4.

The Recovery Plan estimates that a recovered population in the CYE recovery zone will consist of a minimum of 100 individual grizzly bears. Grizzly bears also occur in and use areas outside the CYE recovery zone and population parameters include bears observed up to 10 miles outside the Recovery Zone boundary (Recovery Plan). This biological opinion will use the term CYE to refer to the CYE recovery zone and the band of habitat up to 10 miles around the CYE recovery zone within which Recovery Plan parameters are reported. The BA recovery information is several years old. Revised Recovery Plan parameters are shown below.

<u>Recovery parameters for the CYE based on Recovery Plan Goals (Recovery Plan)</u>:

Goal—Six females with cubs over a running 6-year average:

The 6-year average for 1994-1999 of females with cubs was 1.0 (Tables 4 and 5)

Goal—Eighteen of 22 BMUs to be occupied with females with young from a running 6-year sum:

Twelve of 22 BMUs were occupied. The BMUs 4 and 6 were occupied by females with cubs at some time during 1994-1999. (Tables 4 and 5)

Goal—Human-caused mortality not to exceed 4 percent of the population based on the most recent 3-year sum of females with cubs. Furthermore, no more than 30 percent of the 4 percent human-caused mortality limit shall be females. An interim mortality goal of zero human caused mortalities has been established due to current low numbers.

Reported human-caused mortality is 0.5 (based on 3-year sum of females with cubs). Reported human-caused female mortality is 0 (based on 3-year sum of females with cubs) (Tables 4 and 5).

Goal—The minimum population based on the most recent sum of females with cubs (1997-1999) is 18 individuals. Four percent of 18 yields a human caused mortality limit of 0.72 bears and a female limit of 0.22 for human-caused mortality.

Average known human-caused mortality for 1994-1999 was 0.5 bears and 0.17 females.

Tables 4 and 5 contain CYE demographic parameters from 1993 to 1999. Caution must be exercised when evaluating annual minimum population estimates generated by using unduplicated counts of reproducing females, partially because search effort is not consistent from year to year and can bias the results. It also is inappropriate to compare population parameters or sizes calculated by different methods, because of differing assumptions. These numbers cannot be used for trend data.

Table 4. Annual Cabinet-Yaak recovery zone grizzly bear population and known human-caused mortality, minimum unduplicated counts of females with cubs, and distribution of females with young as described in the 1993 grizzly bear recovery plan (U.S. Fish and Wildlife Service 1993).

Year	Annual Females with Cubs	Annual Adult Female Mortality	Annual All Female Mortality	Annual Total Mortality	4% Total Mortality Limit[1]	30% All Female Mortality Limit[1]	Total Mortality 6-Year Average	Female Mortality 6-Year Average
1988	1	1	1	1	0	0		
1989	0	0	1	1	0	0		
1990	1	0	0	1	0	0		
1991	1	0	0	0	0	0		
1992	1	0	0	0	0	0		
1993	2	0	0	0	1.0	0.3	0.5	0.33
1994	1	0	0	0	1.0	0.3	0.33	0.17
1995	1	0	0	0	1.0	0.3	0.17	0
1996	1	0	0	1	0.72	0.22	0.17	0
1997	3	0	0	0	1.12	0.34	0.17	0
1998	0	0	0	0	1.0	0.3	0.17	0
1999	0	0	1	2	0.72	0.22	0.5	0.17

[1] Presently grizzly bear numbers are so small in this ecosystem that the mortality goal shall be zero known human-caused mortalities.

Table 5. Status of the Cabinet-Yaak recovery zone during 1999 in relation to the demographic recovery targets from the grizzly bear recovery plan (U.S. Fish and Wildlife Service 1993).

DEMOGRAPHIC PARAMETER	RECOVERY PLAN TARGET	BEAR YEAR 1999 (KASWORM ET AL. 2000)
Females w/cubs (6-year average)	6.0	1.0 (6/6)
Mortality limit (4% of minimum estimate)	0.72	0.5 (6-year average)
Female mortality limit (30% of total mortality)	0.22	0.17 (6-year average)
Distribution of females with young	18 of 22	12 of 22

In 1993, Kasworm and Thier (1994) estimated the minimum population in the entire CYE at approximately 12 individuals. Kasworm and Manley (1988) estimated the Cabinet portion of the CYE alone supported a population of 15 or fewer bears grizzly bears. The Service's 1999 finding stated there was insufficient data to change the 1988 estimate. There were 4 female grizzly bears transplanted into the Cabinet Mountains from 1990-1994, sightings of individual bears in 13 of the 14 BMUs in the Cabinets, and sightings of females with young in BMU 2, 4, 6, 7, 20, and 21 since the 1988 study (Kasworm et al. 2000). Kasworm et al. (2000) updates the 1999 finding. Even though there was insufficient data to change the estimate of 15 or fewer bears in the Cabinet portion of the CYE, the increase in sightings of individuals, females with young and the augmentation of bears to the CYE are positive indicators (Kasworm et al. 2000).

The Yaak portion contains 40 percent of the CYE. Unduplicated counts of bears over 3-year intervals and total counts of bears from 1989-1999 indicate a minimum population of 30 grizzly bears in the Yaak or 22 radioed bears and 8 unmarked individuals (Kasworm et al. 2000). Kasworm et al. (2000) note that nine of these bears are known or suspected to have died during 1989-1999. Minimum populations based on the information in the 2000 report revise earlier estimates in the 1999 finding and indicate the Yaak portion to be approximately 20 bears, not including credible reports from the public of grizzly bear observations, which suggest a population estimate of 20-30 bears in the Yaak portion of the CYE would be conservative (Kasworm et al. 2000). The 1999 finding and update by Kasworm et al. (2000) conservatively estimates the CYE recovery zone population, including both the Cabinet and Yaak portions of the ecosystem to be 30-40 grizzly bears.

Using data up to and including 1998, the 1999 finding reported the estimated finite rate of increase (lambda) from 1983-1998 was 1.100 (95 percent confidence interval = 0.971-1.177), which equated to an annual exponential rate of increase (r) of 9.5 percent (U.S. Department of the Interior 1999). However, because the confidence interval for this range spanned 1.0, the Service was unable to statistically conclude this reflected an increasing population (1999 finding). This was thought to be an artifact of small population sizes that have an unrealistic estimated survival rate for yearlings. Kasworm et al. (2000) recalculated the population trend estimate incorporating 1999 data to indicate a finite rate of increase (lambda) of 1.026 (95 percent confidence interval = 0.883-1.124), and an estimated annual rate of change (r) of +2.57 percent. Abnormally high mortality in 1999 influenced the calculation to reduce the rate of increase (Kasworm et al. 2000).

The method Kasworm et al. (2000) used to estimated a CYE population of 30-40 grizzly bears is not comparable to the Recovery Plan's minimum population estimate of 100 grizzly bears needed for recovery of the CYE. The estimate of 18 grizzly bears, derived using the parameters described in the Recovery Plan, is comparable to the 100 grizzly bears needed for recovery in the CYE. Grizzly bear population data is difficult, time-intensive and expensive to obtain, and in small populations, may be inconclusive. In small populations such as the CYE, methods dependent upon capture or sightings may not lead to reliable population estimations. Grizzly researchers evaluated methods to determine population size and rate of change at the ecosystem scale at the request of the IGBC (Interagency Grizzly Bear Committee 1996), but none of these have yet replaced the Recovery Plan population parameters methods.

The Recovery Plan's formulations for population parameters have been used for several years. Current methods, although imperfect, provide a consistent measurement of population parameters over time. Consistency in approach is required for ascertaining the progress of this population toward achieving the annual population goals and parameters stipulated in the Recovery Plan, but should not be considered a population trend estimate.

Population data should be used with care in small populations. Telemetry information has increased our knowledge of grizzly bear behavior and habitat use, enabling finer scale stratification of the habitat when surveying for bear presence and may have resulted in greater detection of grizzly bears. The perception of an increasing bear population may be a product of both more bears and improved survey techniques or it may be that initially there were increases in grizzly bear numbers and more recently, grizzly bear population growth may have been static.

Mortality

Human-caused mortality is one of the greatest threats to grizzly bears in this Ecosystem. Over the 18-year period from 1982 and 1999, there were 19 known mortalities, 11 of which were human-caused (Kasworm et al. 2000), Appendix B. Actual mortality is likely to be higher, given the remote habitats typically occupied by grizzlies and the low probability of finding a dead bear unless it was radio-collared. McLellen et al. 1999 found that known human-caused mortality may represent only 50 percent of total human-caused mortality in the northern grizzly bear recovery zones. The 1999 finding incorporated an additional mortality factor in determinating the change from threatened to endangered was warranted for the Selkirk and CYE grizzly populations.

Harris (1985) reported that the maximum human-caused mortality rate that could be sustained by a grizzly bear population without population decline was 6 percent. According to the Recovery Plan, a recovered population of approximately 100 bears in the CYE could theoretically sustain a total of 6 bear mortalities (6 percent of the population) or 2 female deaths (30 percent of the total mortality) annually. To facilitate recovery, the Recovery Plan goal addressing mortality limits states that known human-caused mortalities may not exceed 4 percent of the population estimate, and that no more than 30 percent of this mortality shall be females. The current mortality goal is actually zero because of the small number of bears in the population.

Mortalities in the CYE were indicating a declining trend until 1999 (Appendix B). In 1999 the CYE bear population sustained five mortalities, of which a subadult male and an adult male were human-caused. This level of percent mortality was unusually high when compared with recent history. If known human-caused mortality is a proportion of the total human-caused mortality (McLellen et al. 1999), the total grizzly bear mortality may be much higher. Sustaining this type of mortality in future years may have serious ramifications on the stability of this population.

Six total known mortalities of grizzly bears have occurred in the CYE or within 10 miles since 1994-99 (Appendix B). Three of these were believed to be human-caused. Five bears were known to have died in 1999. Human-caused deaths resulted from one defense of life situation (female subadult) and one management control situation. A male grizzly bear was euthanized in by authorities because of adverse interactions with humans that were precipitated by lax sanitation procedures in the Yaak area adjacent to Kootenai lands. Natural causes took the lives of the other three bears. The adult female and two cubs were thought to have been killed by another bear, possibly a male grizzly bear (Kasworm et al. 2000).

<u>Environmental Baseline Habitat-Forest Plan Standards and Associated Assessment Criterion</u>

The Forest Plan has several broad grizzly bear standards that are applied to projects in grizzly habitat. Associated assessment criterion to implement these standards were developed through informal and formal consultations with the Service. Although these measures are not officially standards under the Forest Plan, they have become a standardized way of addressing impacts to grizzly bears and will be referred to as Forest Plan standards or associated assessment criterion in this biological opinion. Draft memorandum 1950-2670, dated September 23, 1999, addresses the specifics of grizzly bear analysis/Forest Plan standards based on the Interim Access Strategy (U.S. Forest Service, in litt. 1999) and clarifies additional assessment criterion. Access standards are applied only to MS-1 habitats. The BA addresses Forest Plan standards and associated assessment criterion and guidelines for bears including the terms and conditions from the 1995 ITS on the Forest Plan. Forest Plan standards and associated assessment criterion address the impacts of roads on grizzly bears and consider standard forestry activities—harvest, road building and maintenance, recreation, special forest products. Where applicable, the baseline level is addressed under each Forest Plan standard or associated assessment criterion below.

The BA addressed existing conditions for 1997, in most cases, and presumed the project would begin in 2000. Delays in consultation necessitated some minor updates in numbers related to the existing condition. There have been no additional projects proposed in the BMUs beyond those addressed in the BA (Wayne Johnson, pers. comm. 2000). Delays in some projects also have resulted in actual conditions on the ground being different than portrayed in the 1998 Rock Creek BA. For purposes of this biological opinion, all actions and related effects that have been permitted are considered ongoing and are part of the environmental baseline of the Rock Creek Project. Between BA preparation date and the preparation of this biological opinion, other projects have been completed. Because slightly different conditions were assumed in the Annual Forest Plan monitoring results (reported in Table 8) (U.S. Forest Service 1998, 1999, 2000), there may be small discrepancies between the BA and Table 8.

Habitat Effectiveness

Forest Plan standard or associated assessment criterion is 70 percent or more of secure habitat (habitat effectiveness) within a BMU.

Habitat effectiveness is the percent of secure habitat remaining within a BMU after the zone of influence around major activities is subtracted. The Forest Plan defined 70 percent or more habitat effectiveness in a BMU as adequate for bear security. The Panhandle Forest Plan, as amended (U.S. Forest Service 1995) used a similar 70-square mile habitat effectiveness threshold for bear security and the Lolo Forest Plan had no habitat security standard other than core. The Lolo began reporting habitat security information, in terms of habitat effectiveness in 2000 (bear year 1999) (Tricia O'Connor, Lolo Biologist, pers. comm. 2000). A zone of influence (generally one-quarter mile) to each activity (open roads, harvest areas, private lands, disturbances etc) is calculated and added to the area encompassing each activity. Each influence zone represents the distance which bears are assumed to be affected or displaced by the given activity. The habitat around the activity is "ineffective" or unusable during the life of the activity due to the disturbance. Habitat effectiveness was introduced in a cumulative effects model (Christenson and Madel 1982) and incorporated into the Forest Plan. Habitat effectiveness is a similar concept but the calculations for habitat effectiveness are slightly different, as it includes a buffer around major activities, while core addresses only roads and high use trails. (See Habitat-ITS).

Habitat effectiveness provides a measure of bear security within each BMU, but does not address habitat quality or the distribution of ongoing actions within a BMU. Table 6 displays the 14 ongoing actions in BMUs 4, 5, and 6 for the period 1998 - 2006 authorized or otherwise carried out by the Kootenai that have undergone consultation. The table indicates the BAAs affected and when these actions would occur.

Table 6. Environmental Baseline—Other ongoing projects within the vicinity.

BEAR ANALYSIS UNIT		PROJECT				
		1998	1999	2000	2001-05	2006-35
BMU	BAA					
6	7-6-1	AB	A	CX	Y	Z
	7-6-2					
	7-6-3					
	5-6-4					
	5-6-5		IN	IN	IN	IN
	5-6-6		L	L	L	L
	5-6-7		K			
5	7-5-1					
	7-5-2			X	Y	Z
	7-5-3			X	Y	Z
	5-5-4					
	5-5-5		M	M	M	M
	5-5-6		M	M	M	M
4	7-4-1					
	7-4-2					
	7-4-3		H	H		
	7-4-4		H	H		
	7-4-5					
	7-4-6					
	7-4-7			X	Y	Z

I/ Each letter represents a separate major activity as shown below. Activities are included in cumulative effects analysis.

A= Cedar Gulch Timber Sale
B = Sterling logging of private land
C = Cedar Gulch Timber Sale site prep and reforestation
D = Lost Girl Timber Sale
E = Lost Girl Timber Sale site prep and reforestation
F = North Sorrel Heli Timber Sale
G = Corral Salvage Timber Sale
H = Berray Mountain Timber Sale
I = Skranak Mine
J = MFP Private Logging
K = Noranda Montanore Powerline (counted as major activity due to helicopter use)
L = Harpole Mine
M = Noranda Montanore mine project
N = Bear Lakes private property access and activity
X = Sterling Rock Creek Project Exploration
Y = Sterling Rock Creek Project Construction
Z = Sterling Rock Creek Project Operation and Rehabilitation

The Panhandle and the Kootenai share the management of two BMUs (13 and 14). A small portion of BMU 21 is in the Kootenai and is managed by the Panhandle. As of bear year 1999 (U.S. Forest Service 2000a), BMUs 13 and 14 each have 71 percent security habitat. Fifteen (of 22) BMUs on the Kootenai are currently have 70 percent security habitat or more. The remaining five BMUs are deficient and range from 61 percent to 68 percent security habitat (Table 8).

The Lolo Forest Plan does not require management for security habitat. The Lolo Forest Plan does require the Lolo to manage for displacement habitat and open road densities within BAAs. There are 17 BAAs in BMU 22. All but 2 of those BAAs have less than 1 mile per square mile of open road densities, and 11 have not had any major activity within the last 10 years. The CYE portion of the Lolo complies with the ITS and has calculated core for BMU 22 (See Table 8). The Lolo also began providing habitat security information for BMU 22 in 2000 (for bear year 1999) (Tricia O'Connor, pers. comm. 2000). BMU 22 habitat security was 70 percent.

Fourteen of the 18 BMUs managed by the Kootenai and Lolo in the CYE, BMUs 1-17 and 22, currently meet the BMU 70 percent standard for grizzly bear security habitat. BMUs 4 and 6, which are two of the on-site BMUs affected by the Rock Creek Project are below the standard in 1999. The BA (page 20) states that baseline habitat effectiveness is:

BMU	4	62.5 percent
BMU	5	74.5 percent
BMU	6	68.1 percent

<u>Linear Open Road Density by BAA</u>

The Forest Plan standard or associated assessment criterion is 0.75 miles per square mile or more per BAA in MS-1 habitat, unless there is an inactive BAA with less than 0.75 miles per square mile to provide security during the life of the project and the MS-1 habitat in the BMU as a whole has an average Open Road Density (ORD) of less than 0.75 miles per square mile.

Prior to the ITS, the Kootenai addressed the influence of roads on bears and other wildlife by establishing an ORD standard of no more than 0.75 linear miles of road per square mile within BAAs. Roads in MS-3 habitat are excluded from ORD calculations. The BAAs were used as analysis units for the cumulative effects model (U.S. Forest Service et al. 1988). The ORD is calculated by dividing the total miles of roads open to the public by the total area (square miles) within the BAA.

The ITS stated that the risk of grizzly bear mortality and substantial under-use of habitat was significantly higher in BAAs where the ORD standard has not been achieved than in BAAs that achieve the standard. As of the July 27, 1995, ITS to the Forest Plan, 18 BAAs in the Kootenai exceeded 0.75 miles per square mile. As of 1999, 5 of the 20 BAAs within the on-site BMUs 4, 5, and 6 affected by the Rock Creek Project exceed 0.75 miles per square mile (Table 7).

Table 7. Baseline Open road density (mile per square mile²) by Bear Analysis Areas affected by the Sterling Rock Creek Project† as compared to available 1995 Incidental Take Statement information.

BMU/BAA		1995 (ITS)	1999
		Miles per square mile averaged across the BAA	
BMU 4	741		0.12
	742		0.32
	743		0.66
	744		
	745		
	746		
	747	0.88	0.62
BMU 5	751		0.61
	752	0.79	0.86
	753w		
	554‡w		
	555‡	1.13	1.17
	556‡		0.72
BMU 6	761		0.77
	762		
	763w		
	564w		
	565		0.43
	566	1.04	1.18
	567‡		0.85

Blanks indicate either zero road density or all roads are in MS-3 habitat (which does not get calculated into ORD measurements). (From Table 13 in BA, page 27).

W All of this BAA is in wilderness, although other many other BAAs have some wilderness or roadless area as well.

† Bear analysis areas where the proposed Sterling Rock Creek Project will occur (bold text), but not including the project.

‡ Montanore Mine (Noranda Minerals Corp.)

Montanore was approved in 1993 and affected BAAs 556, 555, and 567. There was minor construction on the mine adit, but the adit was closed and construction on that mine has been suspended for an indefinite time. The project is still part of the baseline for this biological opinion. However, mitigation for Montanore has not been implemented, including road closures by the Kootenai. The BAAs 761 (U.S. Forest Service Cedar Gulch) and 566 (private timber) exceeded 0.75 mile per square mile while active in 1998, 1999 and 2000. The BAA 566 ORD is 1.18 due to private timber harvest and Hapole/Skranak Way-up/Fourth of July mine access. The BAA 566 has exceeded the standard for years.

Displacement Area by BAA

Forest Plan standard or associated assessment criterion is to provide displacement habitat in an undisturbed BAA adjacent to each BAA affected by a major activity. See discussion of core areas under the Environmental Baseline related to the ITS.)

Displacement analysis was conducted in the BA for this project and displacement BAAS are reported in the Effects section.

Opening Size

Forest Plan standard or associated assessment criterion is to design harvest units to be 40 acres or less. If exceeding 40 acres under justifiable reasons, no point in the resultant opening should be more than 600 feet from cover (maximum 1,200 foot across).

The BA does not describe the abundance or distribution of openings in the baseline condition, but historically projects have been planned to comply with this standard and openings within the action area comply (Wayne Johnson, pers. comm. 2000).

Movement Corridors

Forest Plan standard or associated assessment criterion is to maintain unharvested corridors at least 600-feet wide between forest openings or natural openings. Functional hiding cover has a minimum of three sight distances (after harvest), where a sight distance is the mean distance at which 90 percent of an animal is hidden from view.

The BA does not describe the abundance or distribution of movement corridors in the baseline condition, but historically projects have been planned to comply with this standard. Adequate movement corridors occur within the action area at the current time (Wayne Johnson, pers. comm. 2000).

Seasonal Habitat Protection

Forest Plan standard or associated assessment criterion follows for:

1. Spring habitat protection--Objective is to schedule activities within spring habitat (southerly aspects less than 5,000 feet elevation) outside spring season (April 1-July 15).

2. Den site protection--Objective is to allow activities within .5 mile of known den sites only outside the denning season (November 15-April 1).

The Service considers spring seasonal habitat components to be well-distributed but relatively unavailable throughout the grizzly bear recovery area due to the presence of human developments (roads, dwellings, and habitat fragmentation). Spring habitat was analyzed by BMU core (see Environmental Baseline-Habitat-ITS-core area).

Huckleberry fields are important in the fall for the CYE bear population. The BA states there are no large huckleberry fields in the project area. Kasworm et al. (2000) mentioned that many of the huckleberry fields that were stimulated by fires in the early 1900s have declined under closing forest canopies. Riparian habitat and wetlands provide support succulent vegetation important to bears. A small wetland, classified as spring habitat, occurs on the proposed tailings impoundment site. The wetland is currently MS-3 habitat and is considered unavailable to bears due to high road densities. Several small marshy lakes occur in the wilderness area on the surface several hundred feet or more above the underground rock formation that will be mined. Although these lakes provide succulent vegetation later in the season, they are likely unavailable under snow during the spring.

Denning habitat is generally defined above 5,200 feet in elevation on north and west aspects in the Cabinet mountains, although this information is based on a very limited sample size of denning grizzly bears (Kasworm and Thier 1992). The Rock Creek drainage contains suitable denning habitat, but the BA states that none exists within the Rock Creek Project SEIS permit area. A transplanted bear that died later that year of unknown causes used one den site in the Rock Creek drainage (BA).

Environmental Baseline Habitat-Incidental Take Statement

The ITS addressed access managment in the take allowance to the Kootenai. The Kootenai was directed to participate in development of access management recommendations for open and open motorized trail route densities, total motorized route densities, and core through access committees, as approved by the IGBC ecosystem subcommittee. The ITS identified an interim period between the date of the ITS (1995) and the IGBC's recommendations to establish forest-wide access management direction. During the interim, the Kootenai would conform to direction provided in the Forest Plan. Further, projects would exceed the ITS if proposed projects increased the density of open road density above the Forest Plan standard, increased the density of open motorized trails route density, increased the net total motorized access route density, or decreased the existing amount of core areas in the affected BMUs. The Service recognizes the SCYE Access Taskgroup as the access committee addressed in the ITS.

Open Road Density

The ITS term and condition is no increase in ORD above the Forest Plan standard. The Forest Plan standard or associated assessment criterion is 0.75 miles per square mile or more per BAA in MS-1 habitat. Unless there is an inactive BAA with less than 0.75 miles per square mile to provide security during the life of the project and the BMU as a whole has an average ORD of less than 0.75 miles per square mile.

Total Motorized Route Density

The ITS term and condition is no net increase in TMRD.

The OMRD, TMRD, and Core parameters for CYE BMUs in 1998 and 1999 listed below are compared to the baseline values. Baseline is considered the first year the moving windows analysis was conducted, 1997. Habitat effectiveness since 1995 and OMRD, TMRD, and Core parameters since 1997 are displayed in Table 8. Blanks below indicate the National Forest that manages that BMU did not compute these parameters for those years. The 1999 Annual Forest Monitoring report had significant errors that have been corrected in the table below (U.S.Forest Service, in litt. 2000). Corrections will be made in the 2000 Annual Forest Monitoring report and are on file at the Kootenai (Bob Summerfield, Kootenai Biologist, pers. comm.).

Table 8. Status of Cabinet-Yaak Bear Management Units (Forest Plan Annual Reports)[d].

	OMRD % of BMU having Open roads >1 mile/square mile			**TMRD % of BMU having Total Roads >2 miles/ square mile**			**% CORE**			**% Security Habitat (square mile) (Habitat effectiveness)**				
Wakkinen and Kasworm 1997	33 percent			26 percent			55 percent			Not addressed in the research				
BMU	**BEAR YEAR**			**BEAR YEAR**			**BEAR YEAR**			**BEAR YEAR**				
	97	**98**	**99**	**97**	**98**	**99**	**97**	**98**	**99**	**95**	**96**	**97**	**98**	**99**
1	18	23	13	8	16	9	73.0	69.0	84	81	81	86	85	88
2		29	18			15			77.2	85	85	85	83	85
3			23			31			57.2	77	78	76	78	78
4		39	39		28	27		62	61	63	63	62	62	62
5	29	29	28	23	23	21	60.4	60.4	61.4	74	73	74	75	74
6	37	37	39	35	35	34	51.0	51.0	51.0	72	66	66	68	67
7	27	27	23	22	22	19	65.0	65.0	65.7	82	82	81	81	79
8	39	32	31	23	23	21	56.0	54.0	56.9	74	77	77	77	73
9			36			31			52.6	76	76	76	73	71
10	50	50	50	41	41	37	42.0	42.0	44.7	70	68	57	57	61
11	32	32	33	31	31	31	52.3	52.3	52.2	70	74	74	70	73
12			43			28			55.7	49	62	57	44	62
13[a]	34	34	37	23	23	26	57.8	57.8	56.4	73	72	72	72	71
14[a]	31	31	32	24	24	22	57.8	57.8	60	72	74	74	74	71
15	32	32	30	45	45	34	34.7	34.7	46.3	70	68	63	66	70
16	38	38	36	45	45	42	38.3	38.3	39.7	73	72	70	70	74
17	43	43	37	44	44	33	32.0	32.0	42	68	68	68	71	71
18	28	28		37	37		45.0					72		
19	37	37		39	39		39					56		
20	38	38		24	24		59.2	59.2				73		
21[b]	36	36		28	28		62.4	62.4				69		
22[c]	41	41		42	42		47.7	47.7						70

[a] Management is shared between the Idaho Panhandle National Forest and Kootenai. Blanks: information was not calculated
[b] Managed solely by the Idaho Panhandle National Forest.
[c] Managed solely by the Lolo. (1999 data from Tricia O'Connor, U.S. Forest Service, Lolo)
BMU 4 Core decreased due to Bull Lake Estates (U. S. Fish and Wildlife Service1999)–resulted in a change from MS-1 to MS-3.
[d] Information for bear years 1998-1999 above were from U.S. Forest Service Annual Reports (U.S. Forest Service 1998, 1999, 2000).
1997 data is from the ITS which is considered baseline data for "no net loss" (ITS page 7).

Table 8 displays the OMRD, TMRD and core calculations that Wakkinen and Kasworm (1997) documented for six female grizzly bears in the CYE. It also displays the moving windows in the CYE since 1997. Although the research numbers are not currently required in the ITS, 33 percent OMRD, 26 percent TMRD and 55 percent core indicate a level of access in habitat that supports female grizzly bears. These numbers provide a point of reference for the reported BMU calculations.

<u>Core Area</u>

The ITS requires no net loss of core.

Although there is no numeric standard required for core in the ITS, research indicates that at least 55 percent core occurred in average female home ranges in the CYE. The ITS allows no loss in core habitat without concurrence from the Service. The USFS is attempting to achieve core areas encompassing 55 percent in Priority 1 BMUs to provide habitat considered important to female grizzly bears (Wakkinen and Kasworm, 1997). The BMUs 4 and 6 are Priority 1 BMUs. The BMUs directly affected by the project and considered for mitigation habitat are referred to as on-site BMUs. On-site BMUs 4 and 6 are Priority 1 BMUs and on-site BMU 5 is a Priority 2 BMU.

The BA (BA Table 18, pg 34) identified approximately 60.9 percent, 60.2 percent, and 49.9 percent core habitat present in BMU 4, 5, and 6 prior to the Rock Creek Project. The BMU 6 core, according to the BA is 50.1 percent and drops to 49.9 percent following private actions in the BMU unrelated to the Rock Creek Project. As such, it is considered as pre-project baseline. The BA explains the low number in BMU 6 is the result of private activities on Plum Creek and Montanore (Wayne Johnson, pers. comm. 2000). The BA contains no strategy to achieve 55 percent core area.

The annual report information (Table 8) indicates that 10 of the 17 Kootenai BMUs meet or exceed 55 percent core value as of 1999. Although not all of the BMUs have yet achieved 55 percent, all of the 17 Kootenai BMU core areas that have more than 1 year of data show increases (improvement) since 1997 except 11 and 13.

Core areas are to be designed to include the full range of seasonal habitats available in the BMU. The BA analyzed seasonal habitats within the core areas affected by the Rock Creek Project. Appendix 9 of the BA displays habitat components important to grizzly bears in the project area. The Kootenai conducted an analysis of the amount of potential spring habitat (less than 5,000 feet elevation with south, east, or west aspect) captured by the designated core areas within each BMU. The BMU 4 contains the greatest abundance of spring habitat within the core area, estimated in the BA to be 27,633 acres (56 percent of the core area and 34 percent of the total area of BMU 4). The BMUs 5 and 6 contain an estimated 11,329 acres (36 percent of the core area and 10 percent of the total area of BMU 5) and an estimated 14,781 acres (50 percent of the core area and 15 percent of the total area of BMU 6) of spring habitat components within the core area.

Environmental Baseline - Other Factors

The scope, complexity, length and permanent nature of changes on the landscape resulting from the Rock Creek Project require that additional factors beyond those addressed in the Forest Plan and ITS be considered related to the mine, including impacts related to mine employees, influx of residences, increased trail use, sanitation, noise, transportation of ore, water issues, permanent loss of habitat and tailings placement.

Human Impacts

In 1990, Sanders County had a population of 8,669 people, as compared with 8,675 in 1980 (U.S. Census Bureau, Population Estimates Branch, 2000). The Census and Economic Information Center (Montana Department of Commerce, October 1999) predicted that Sanders County would be 10,190 people by 1999 (8.5 percent over 9 years) and predicted a growth to 13,930 by 2025 (7.3 percent over 30 years), similar to the growth predicted Montana-wide over the same time period (7.2 percent). Montanore is an approved mining project near the Rock Creek Project currently in suspension. It was predicted to increase the Sanders County population by 450 mine-related jobs and another 200 support-associated jobs (predicted primarily in Lincoln County) (U.S. Forest Service and Montana Department of Environmental Quality 1992). This increase is considered additional to the projections above by the U.S. Census Bureau, and is part of the baseline of the action area.

Recreational use has been increasing in the area. Non-motorized use of the Rock Creek Trail has been steadily increasing even without the Project, from an average of 0.7 people/day during the active bear year (April 1 - November 15) during 1990 to high of 1.8 people/day during 1996, a 157 percent increase over levels of 6 years ago. The number of parties per week also is increasing. Estimates of the number of parties per week were made during two, 3-year evaluation periods (1990-1992 and 1995-1997) using registration card data that estimated 5.7 parties per week during 1990-1992 and 8.2 parties per week during 1995-1997, resulting in a low use level rating for the Rock Creek Trail. Actual use is typically higher due to trail use by unregistered users, ranging from 50 percent to 400 percent (BA). Correcting for the actual trail use, the existing use may currently range from 10.5 to 21 parties per week. High use periods are summer (generally recreational hikers) and spring/fall (with more hunters). High use trails are those with more than 20 parties a week (Interagency Grizzly Bear Committee 1997) and are buffered and subtracted from Core and habitat effectiveness calculations.

Sanitation

Poor sanitation is one of the threats identified in the listing of grizzly bears. Human food and garbage, compost, bird feeders, livestock and their feed, pet food, bee hives, barbeque grills, fruit trees and garden produce, unsecured food in campgrounds, gut piles and carcasses are all strong attractants to black and grizzly bears. The attraction is often strong enough to overcome a bear's natural cautiousness around humans. Because bears are animals highly dependent on learned behavior, the pattern with attractants is usually progressive: a bear encounters a human-related food source and gets a food reward. Females with cubs can teach their young to seek human food, adversely affecting the second generation as well. If not curtailed by removing the food source or making it inaccessible and dissuading the bear through harassment, anti-bear dogs or other deterrents, the bear becomes habituated and bolder, leading to predictable consequences, most involving removal of the bear from the ecosystem (see Effects-Habituation).

The Kootenai currently does not have a forest-wide food storage order requiring the public to secure food while working, camping, hiking or otherwise using the forest, nor does it have bear-resistant garbage containers at all sites within the Recovery Zone. Education pamphlets are available at Kootenai District offices as well as other public places describing good hygiene in bear country. Many residents in the area have been responsive to Montana Fish, Wildlife, and Parks information and other agency brochures to keep wildlife-friendly households, but others have been resistant or uninformed about sanitation issues and grizzly bears. There have been no known recent grizzly bear incidents in the area, possibly due in part to the low bear population, low human population and large portions of roadless area. Few black bear incidents have been reported. Either incidents are too few or insignificant to report or landowners have dealt with the problems on their own (without reporting to Montana Fish, Wildlife, and Parks). The likelihood of increased hunting pressure and possibilities of human-bear encounters increases with additional people living or recreating in the area (Bruce Sterling, Montana Fish, Wildlife, and Parks Biologist, pers. comm. 2000).

Noise

Baseline noise levels are measured in decibels, using the A scale (dBA). Zero dBA is the intensity when sound is audible to a young person with normal hearing. Noise is perceived as “doubling” for each 10 dBA. The lowest level at which sound begins to degrade the environment is 35 dBA (Montana Department of Environmental Quality and U.S. Forest Service 1998). Baseline ambient noise levels run from 25 dBA in the Cabinet Wilderness in calm conditions to 50 dBA on Highway 200 (with highway traffic).

Associated Access and Facilities

Access is addressed under Habitat-Forest Plan standards and associated assessment criterion and Habitat-ITS. Additional impacts from support facilities, rail lines and powerlines are associated with the project. Currently a local rail system, Montana Rail Link, runs along Highway 200 in a fairly developed utility corridor, largely located on relatively flat ground and runs along the border of the CYE recovery zone. This rail system runs one train twice a week from Paradise to Trout Creek with the potential to connect to Sandpoint, Idaho and Missoula, Montana. A Bonneville Power Administration 230 kV power transmission line runs along Highway 200 and, branching from that, an Avista Corporation 230 kV power transmission line runs from Noxon Reservoir to Hot Springs, just south of the southern boundary of the Cabinet Mountains Wilderness Area. The main access road to the Rock Creek Project Mine, FDR 150, currently gets approximately 33 one-way trips per day, based on traffic counter use (SEIS). The road is not plowed in winter, nor is it gated. Primary use is in summer.

Other Projects and Activities

Table 6 shows the other ongoing projects within the CYE. The CYE has a narrow recovery zone. A semi-developed portion of predominantly private land of mixed ownerships, approximately 22 miles long and up to 5 miles wide, occurs near the middle of the recovery zone and is classified as MS-3 habitat, or habitat within which grizzly bears are discouraged. In the event of human bear conflicts, the conflict will be resolved in favor of humans. This portion of primarily spring habitat which is rendered unsuitable to bears as a result of the high density of people, provides human-food attractants and higher risk of mortality due to human-bear interactions resulting from concentrations of residences, roads, attractants such as dumpsters, and more human use in terms of hunting and recreating in this area.

Consultation on Montanore was completed in 1993 (U.S. Forest Service and Montana Department of Environmental Quality 1992; U.S. Fish and Wildlife Service 1993b). Montanore will access the adjacent underground ore body, separated only by a fault, as the Rock Creek Project, but from the northeast side of the crest of the Cabinet Mountains and primarily impacts BMUs 5 and 6. Like the Rock Creek Project, it will mine under the wilderness area, will have facilities and road concentrations on the surface adjacent to the wilderness area, and will be a long term project (estimated 3-year construction and 15-year operation) (U.S. Forest Service and Montana Department of Environmental Quality 1992). The Montanore biological opinion identified a disturbance in 4,489 acres of land either physically altered or influenced by activity disturbance, primarily in BMU 5. Although the mine was permitted in September 1993 (U.S. Forest Service 1993b) the mine has not yet begun construction or operation. The mine is shutdown for an unknown period. Reinitiation of operations may coincide with operations at the Rock Creek Project, since both will be affected by similar market conditions.

Montanore impacts are considered baseline, and Montanore is considered to partially fragment the ecosystem and is likely to jeopardize the continued existence of the Cabinet-Yaak grizzly bear population without the implementation of reasonable and prudent alternatives (U.S. Fish and Wildlife Service 1993). The reasonable and prudent alternatives included the implementation of road closures to, "result in habitat effectiveness levels higher than presently required by the Kootenai Forest Plan open road density standard. In other words, road closures that bring the Kootenai into compliance with its Forest Plan road management standard cannot be considered mitigation for the Noranda (Montanore) Mine." (U.S. Fish and Wildlife Service 1993).

To date, the mitigation plan for Montanore has not been implemented (Al Bratkovich, Kootenai biologist, pers. comm. 2000) and BMU 6 baseline for habitat effectiveness remains below Forest Plan standards or associated assessment criterion.

Also in the CYE, but outside the action area, the Genesis Troy copper/silver mine has been in operation for over 20 years and affects approximately 50 acres of disturbed area at the mine site on USFS-managed land and another 400 acres of private land for the tailings area (David Young, Sterling Mining consultant, in litt 2000) within the CYE in BMU 3. The mine is currently shut down due to market conditions. Ongoing maintenance, primarily pumping water from the underground cavities, continues with a skeleton crew, and roads will remain gated. David Young (Sterling Mining consultant, in litt 2000) predicts approximately 4 years of operation is possible on this ore body. Sterling plans on completing the Troy Unit during the permitting, evaluation adits and development adits are completed at the Rock Creek Project. Impacts from the Troy mine are not considered to directly impact bears in the southern portion of the CYE, but might cumulatively effect the CYE population as a whole.

Several small patented mining claims (15 or more, based on Figure A and B in BA, Appendix 10) occur along the borders of the wilderness area. As patented land, these small parcels also increase the risk of adverse grizzly bear-human interactions due to food and people on-site throughout the day and night, and often poor sanitation practices or attitudes non-supportive of grizzly bear recovery. Although the Kootenai can influence access across USFS lands, subject to ANILCA (Alaska National Interest Lands Conservation Act, 36 CFR 251 Subpart D) and other regulations, the Kootenai states they have no jurisdiction on private lands. Potential uses of these private lands include clearcutting, building cabins or other facilities, operating machinery, or running hunting camps. All properties can legally be accessed by foot or horseback, and some have motorized access rights.

Not all of the patented claims shown in Figure A and B of the BA (BA, Appendix 10) have legal road access. Fourth of July and Way-up mines recently applied for permanent access to their patented claims and received an opinion (U.S. Fish and Wildlife Service 1998, amended 1999) limiting access. Access to the Fourth of July and Way-up mines was recently authorized by the Kootenai in BMU 6 (U.S. Forest Service 2000b). The biological opinion was amended because the Kootenai was unable to comply with the original terms and conditions regarding access. The Kootenai has assured the enforcement of good sanitation on USFS lands, as specified in the terms and conditions of the Fourth of July/Way-up Mine biological opinion, but stated they have no jurisdiction on patented land (U.S. Forest Service 2000b). The ROD by the USFS (U.S. Forest Service 2000b) to implement the amended opinion is currently under legal dispute. There also are possibilities of recreational development on some of the properties in the area.

Linear open road density increases, habitat effectiveness below the Forest Plan standard and core below the 55 percent result from these projects coupled with the already degraded environmental baseline in BMU 6 (U.S. Fish and Wildlife Service 1998, 1999). Baseline habitat effectiveness for BMU 6 assumes that Montanore mitigation has occurred (Wayne Johnson, pers. comm.

2000), but still remains below the Forest Plan standard at 62.5 percent (U.S. Forest Service 1997b). The reasonable and prudent measures for Montanore including road closures and habitat acquisition have not yet occurred on the ground (Al Bratkovich, pers. comm. 2000).

Ongoing forest management activities are included in Table 6. These activities have undergone consultation with the Service where appropriate and have impacts that were largely addressed through the application of Forest Plan standards and associated assessment criterion and adherence to the ITS. Most of these projects are short-term (less than 5 years) in nature and will result in temporary disturbances. Access impacts to grizzly bears associated with these approved projects are reflected in the habitat effectiveness, road and core calculations displayed in the tables above.

Private forest management activities also have and continue to occur within the CYE. Plum Creek is the primary private forest manager in the CYE. The Kootenai has consulted on activities on Plum Creek land that involve Kootenai roads or other permits. Activities on Plum Creek lands that are solely on Plum Creek, but occur within MS-1 habitat lines, are covered under Plum Creek grizzly bear habitat standards which involve a linear open road density standard of 1 mile per square mile, maintenance of cover for bears, and protection of seasonal habitats (U.S. Fish and Wildlife Service 2000, Brian Gilbert, Plum Creek Biologist, pers. comm. 2000). Moving windows analysis, which covers the BMU as a whole, as reported by the Kootenai in Table 8 of OMRD, TMRD and Core includes Plum Creek roads to the extent the Kootenai and Plum Creek have been able to share this information. There may be minor differences in actual road densities on the ground as compared to moving windows calculations as a result of GIS mapping delays of rapidly-changing road situations.

The project area occurs in hunting unit 121. Recreation analysis indicated that hunting has shown a steady increase in the general area since 1984. An analysis of the Rock Creek Project impacts on grizzly bears (BA Appendix 12, Table 6) indicates that 38 percent of the recreational users in the Kootenai are hunters. Hunters accompanied by horses or other pack animals have occasionally dropped animal feed that serves as an attractant to both black and grizzly bears. Mistaken identity mortality of grizzly bears is a risk that increases with the number of hunters, the number of bears and the degree of attractants, although effective public education on how to identify grizzly bears from other animals and how to reduce attractants can help reduce this impact (Appendix B).

EFFECTS OF THE ACTION

Effects of the Rock Creek Project are analyzed together with the effects of other projects that are interrelated to, or interdependent with, that action. An interrelated activity is an activity that is part of the Rock Creek Project and depends on the Rock Creek Project for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. If an activity associated with the project would not occur but for the proposed project, that activity is interrelated or interdependent on the Project. Its effects are analyzed with the Project.

The BA, with supporting information from the draft EIS (U.S. Forest Service 1995) and SEIS (U.S. Forest Service 1998) compared the effects of Alt V of the Rock Creek Project with Forest Plan standards and associated assessment criterion—habitat effectiveness, linear ORD, displacement areas by BAA, opening size, movement corridors and seasonal habitat protection. The ITS terms and conditions also were addressed—OMRD, TMRD, and core. Other factors associated with this action include: human impacts, sanitation, associated access and facilities, noise and fragmentation. The quantification of each of these standards is displayed. The effects of additional households, people and increased human activity directly or indirectly related to the Rock Creek Mine also are addressed below.

The effects to grizzly bears of not meeting the Forest Plan standards, measurement criterion, and/or the ITS terms and conditions, and the effects of other factors on bears will be discussed under the following, and sometimes overlapping, categories:

1. Displacement (from roads or activities)—including habitat effectiveness, ORD, OMRD, TMRD, Core;

2. Habituation/food conditioning and increased mortality risk—related to other human impacts, including recreation, settlement, sanitation, noise; and

3. Habitat loss and fragmentation, including movement corridors, seasonal habitats, displacement habitat.

Effects - Habitat-Forest Plan Standards and Associated Assessment Criterion

Habitat Effectiveness

The Forest Plan standard or associated assessment criterion is 70 percent or more of secure habitat (habitat effectiveness) within a BMU.

Habitat effectiveness in BMUs 4 and 6 are below Forest Plan standard and associated assessment criterion (70 percent), at the current time (1999) and will decrease even further during mine operation according to Table 9. The effects of the Rock Creek Project on habitat effectiveness are displayed as the Net Change line in Table 9. After access management currently identified in the BA, but not including opportunities of access management that may occur as a result of acquiring mitigation properties, is a decline of 0.4 percent in BMUs 4, 5, and 6 as a whole.

Habitat effectiveness in each BMU declines at some time during the Rock Creek Project. Habitat effectiveness in BMU 4 declines from 62.5 to 62.3, but with mitigation returns to 65.5 percent at completion of the mine, 35+ years later. The BMU 5 baseline in the BA is 74.5 percent, which meets the Forest Plan standard, but goes to 64.8 percent at initiation and declines to 64.1 percent during the project, after mitigation habitat and road closures are in place. The Rock Creek Project reduces habitat effectiveness in BMU 5 by 1.1 percent, but the cumulative impacts of other projects in the baseline, including Montanore, cause a 10.6 percent decrease. The other projects responsible for the 10 percent difference are listed in the BA (BA, Appendix 7, page 94). Habitat effectiveness in BMU 6 declines from 68.1 to 65.8 percent throughout the life of the mine and returns to baseline levels, which are still below the Forest Plan standard, after reclamation.

Following Rock Creek Mine reclamation but not including any potential improvements to access management as a result of acquiring mitigation properties, habitat effectiveness in BMU 4 will improve slightly over current conditions and BMU 6 will return to current levels. The BMU 5 will decline from existing levels and remain lower than existing levels after the project. None of the BMUs will meet the 70 percent habitat effectiveness goal of the Forest Plan standards and associated assessment criterion after reclamation. The mitigation plan attempts to compensate for the effects of this long-term habitat degradation by providing conservation easements or purchase of private land in or near the affected BMUs. Neither the precise locations of the mitigation properties, nor the access management associated with such properties have been finalized. Therefore, the habitat effectiveness that will result after acquiring these properties and implementing access management cannot be predicted at this time.

Table 9. Habitat effectiveness of all Bear Management Units in the Cabinet Mountains of the Cabinet Yaak Ecosystem throughout the life of the Rock Creek Mine.

	HABITAT EFFECTIVENESS (%) OF BEAR MANAGEMENT UNITS IN THE CABINET MOUNTAINS		
	BMU 4	BMU 5	BMU 6
Baseline habitat effectiveness 1997 (BA)[a]	62.5	74.5	68.1
1999 Annual Report data (U.S. Forest Service 2000)	62.0	74.0	67.0
Initiation	62.5	64.8	68.0
Year 1	62.3	64.1	65.8
Year 2	62.3	64.1	65.8
Year 3-35	65.4	64.1	65.8
Following reclamation	65.5	64.6	68.0
Net change due to Rock Creek[b]	+1.0	-1.1	-0.3

[a] Habitat effectiveness of the affected BMUs prior to the implementation of the Sterling Rock Creek Project
[b] Net change in habitat effectiveness as a result of the Sterling Rock Creek Mine construction and operation (including full implementation of the proposed road closures in the BA, but not including mitigation lands.
[c] Actual change in habitat effectiveness due to cumulative effects of other actions already approved for implementation in BMUs as explained (BA Appendix 7, page 94)

The actual calendar years of the project will vary from that predicted in the BA, as the BA predicted the mine would be initiated in 2000. The predicted life of the mine also may be shortened or lengthened depending on conditions of the ore body and other factors that cannot be predicted at this time. Habitat effectiveness would remain similar to that displayed, or may be actually better than analyzed, because projects ongoing when the BA was written in 1997-1998 are nearing completion, reducing the predicted cumulative effects during the first 1-3 years of the project. Overall impacts on habitat effectiveness resulting from the Rock Creek Project will remain as displayed.

Linear Open Road Density by Bear Aanalysis Areas

The Forest Plan standard or associated assessment criterion is 0.75 miles per square mile or more per BAA in MS-1 habitat. Unless there is an inactive BAA with less than 0.75 miles per square mile to provide security during the life of the project and the BMU as a whole has an average ORD of less than 0.75 miles per square mile.

Linear ORD calculations by BMU is less than 0.75 miles per square mile at the current time and remain below 0.75 miles per square mile throughout the life and reclamation of the Rock Creek Mine, partially due to the large percentage of roadless or wilderness area within those BMUs and the large amount of disturbance on MS-3 habitat which is not calculated into ORD. When averaged across the BMU, these reduce the linear ORD. The ORD at the BMU scale for the BMUs 4, 5, and 6 would not change significantly during the construction or operation of the Rock Creek Project throughout the life of the mine. With full implementation of the proposed road management plan associated with the Rock Creek Project, but not including any access management associated with mitigation properties, all the BMUs would remain below the maximum 0.75 miles per square miles Forest Plan standard throughout the life of the Project.

The BAA scale ORD is not as favorable throughout the life of the project. Five BAAs (752, 555, 761, 566, 567) within the three affected BMUs currently exceed standards and four (752, 555, 566, 567) would remain high throughout the project and thereafter (Table 10). Montanore is another copper/silver mine located on the northeast side of the Cabinet Mountains. Montanore will be removing ore from a mineral deposit under the Cabinet Wilderness Area that is separated only by a fault line from the Rock Creek Project ore body. Montanore is responsible for high road densities in BAAs 555 and 567. Access to several smaller mining patented properties is responsible for other high road densities displayed in Tables 7 and 10. A BAA with a reported road density of 0.00 does not necessarily imply roadless conditions, but rather may have roads within MS-3 habitat that are not counted in the ORD calculations, according to the Forest Plan standards and associated measurement criterion. The BAAs entirely within wilderness are so noted on Table 7.

The Service's biological opinion on the Montanore mine concluded jeopardy of the CYE grizzly bear population if the reasonable and prudent alternatives were not instituted to reduce impacts to the population. Reasonable and prudent alternatives included improving habitat effectiveness to a level above the 70 percent Forest Plan standards and associated assessment criterion (U.S. Fish and Wildlife Service 1993). The acquisition of mitigation habitat and road closures also were included in that proposal and built into the biological opinion. The mine has not been initiated nor has any mitigation occurred (Al Bratkovich, pers. comm. 2000). Montanore remains inactive, but is considered part of the baseline for the Rock Creek Project.

Table 10. Open-road Density (linear miles road/square mile) for Bear Management Units 4, 5, and 6 by Bear Analysis Area, Management Situation-1 lands only. (From BA Table 13).

Bear Management Unit	**Bear Analysis Area**	**Existing Situation**		**During Rock Creek Project**				**After Action**	**Assigned BAA Displacement Areas for Rock Creek Project BAAs That Exceed 0.75 miles/square Mile**
		1999	2000	2001	2002	2003	2004	2035	
BMU4	741	0.12	0.12	0.12	0.12	0.12	0.12	0.12	
	742	0.32	0.32	0.32	0.32	0.32	0.32	0.32	
	743	0.66	0.66	0.66	0.66	0.66	0.66	0.63	
	744 1/	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	745 1/	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	746	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	747 * 5/	0.62	0.59	0.59	0.59	0.59	0.59	0.62 ?	745 and 746
BMU5	751	0.61	0.61	0.61	0.61	0.61	0.61	0.61	
	752 * 4/	0.86	0.79	0.79	0.79	0.79	0.79	0.79	
	753 w	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	554 w	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	555	1.17	1.17	1.17	1.17	1.17	1.17	1.17	
	556	0.72	0.72	0.72	0.72	0.72	0.72	0.72	
BMU6	761 * 3/	0.77	0.62	0.62	0.62	0.62	0.62	0.62	762 and 763
	762 1/	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	763 w	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	564 w	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	565	0.43	0.51	0.51	0.51	0.51	0.51	0.51	
	566 2/	1.18	1.18	1.18	1.18	1.18	1.18	1.18	
	567	0.85	1.45	1.45	1.45	1.45	1.45	1.45	

* BAA where Sterling Rock Creek Mine active.
1. BAAs affected by Montanore.
1/ All road activity in Management Situation 3.
2/ ORD reduced to 0.95 with Corral Salvage Timber Sale (~1995-96).
3/ ORD reduced to 0.62 with Cedar Gulch TS completion (~1995-96) and Sterling Rock Creek Mine (2000- road 2285).
4/ ORD reduced to 0.79 with Sterling Rock Creek Mine (roads 2741A - .5 mi., 2741x - .2 mi. and 150 -.9 mi.).
5/ ORD reduced to 0.59 with Sterling Rock Creek Mine (road 150-2 miles).
w BAAs within wilderness.

The Rock Creek Project construction phase would result in 3.54 miles of new road and 5.43 miles of reconstructed road (BA). All roads in Alt V total 4.19 miles of new road and 14.15 miles of reconstruction (Kathy Johnson, Montana Department of Environmental Quality, in litt. 2000). These figures do not include small roads within the footprint of the mine and facilities, which are either on private land, are in MS-3 habitat, or are considered to be offset by the acquisition of mitigation habitat associated with this portion of the mine. This area was considered already removed from the habitat base in calculations in the BA (Wayne Johnson, pers. comm. 2000) because these roads are within the footprint of the mine facilities. They will be covered by buildings or the tailings pile, etc. during the production stage.

Implementation of the Project and associated road management mitigation plan described in the BA would result in a net decrease of 0.07 miles per square mile over the baseline, as averaged over all affected BAAs. The Kootenai proposed to restrict public access year-round on 5.65 miles on four different roads currently open to the public during the construction and operation of the Project. These restrictions were designed to reduce the effects from new roads and habitat loss associated with the Project. Roads 2285 (1.61 miles), 2741x (0.18 miles), and 2741 (0.47 miles) would be restricted to motorized access using barriers. Road 150 would be gated to public access for 2.92 miles.

Full implementation of the proposed road management plan would result in a net decrease in open road densities in all but one of the BAAs affected by the Rock Creek Project. Only BAA 752 would remain above the open road density standard at 0.79 miles per square mile, while BAAs 747 and 761 would remain at 0.59 miles per square mile and 0.62 miles per square mile for the 35-year duration of the Project.

The Montanore mine was approved in 1993 and affects BAAs 556, 555 and 567. Construction on that mine has been suspended, but the project is still considered as part of the baseline for this biological opinion. The BAAs 567 and 555, two of the BAAs affected by the Montanore, have existing ORDs of 0.85 and 1.17 mile per square mile. The Kootenai Cedar Gulch in BAA 761 and private timber activities in BAA 566 caused those BAAs to exceed 0.75 mile per square mile while active in 98, 99 and 00. Road closures proposed as mitigation in the Rock Creek Project will reduce BAA 752 ORD to 0.79 and BAA 761 to 0.62, upon completion of the Cedar Gulch Timbersale. Mitigation for the Rock Creek Project also will reduce BAA 747 to 0.59 miles per square mile following road closures identified above.

Some administrative use occurs behind locked gates. At some level, motorized use of closed roads is considered to impart impacts on grizzly bears. At that level, the road is included as an open road in access calculations. Mace et al. (1996) found that increasing road use had increasing impacts on bears, but the lower end of administrative use that could be tolerated by bears without observable displacement was not quantified. Many of the roads within their study area were thought to have had no use, but traffic counters were not installed on gated roads and actual administrative use was not known (John Waller, University of Montana, pers. comm. 2000).

The BA addressed the potential impacts of administrative use by monitoring administrative gate use in 1992, 1993, 1994 using the 1993 Recovery Plan guideline that use of roads should be kept to 14 days per bear year. When administrative use exceeded 14 days per bear year, the BA considered the road open and displayed the results in Table 14 of the BA. Under that scenario, all of the four BAAs directly affected by the Rock Creek Project (747, 751, 752, 761) exceeded the 0.75 mile per square mile standard. The SCYE Access taskforce working group attempted to define "acceptable low intensity levels" mentioned in the IGBC grizzly bear/motorized access management taskforce report (IGBC 1998). In December 1998, after the BA was completed, the SCYE Access taskforce working group finalized a definition of a closed road--if administrative use does not exceed 121 round trips per bear year. The BA states that there is no data to address the round trip measurement of that level of administrative use.

Displacement Area by Bear Aanalysis Area

The Forest Plan standard or associated assessment criterion is to provide displacement habitat in an undisturbed BAA adjacent to each BAA affected by a major activity.

The long-term nature, complexity and permanent changes resulting from the Rock Creek Project required some compensation for the avoidance of important habitat. The Kootenai developed a displacement analysis for this project, following the cumulative effects model (U.S. Forest Service and others 1988) used in the development of the Forest Plan. Displacement areas for this project were designed to primarily address the loss or displacement from spring habitat in and around mine facilities and activity areas (BA). Analysis at the BAA level, which is theoretically a subset of a female's home range, forces consideration of the distribution of secure habitat (and by default, bears) across the ecosystem.

The analysis indicated that more than one BAA would be required to provide undisturbed habitat for activities in BAA 761 and 747. The BAAs 762 and 763 will provide displacement for BAA 761 and BAAs 745 and 746 will provide displacement for activities in 747, as displayed in the final column on Table 10. Major activities will be deferred from displacement BAAs for the life of the Rock Creek Project (BA Tables 15, 16, BA map appendix 14), but displacement BAAs, active BAAs and inactive BAAs change considerably during the early stages of the mine (BA Figures from memo in BA: Grizzly Bear information for ASARCO Mitigation, March 19, 1998). Displacement BAAs provide 177 more acres of spring habitat (defined as less than 5,000 feet) and 7,452 more acres above 5,000 feet than that found in the BAAs that will be disturbed during the project. As noted in the discussion of ORD and Table 10, all road activity within 2 of the 4 displacement BAAs (745 and 762) occurs in MS-3 habitat, which does not count against road densities, but rather has human activity that may impact grizzly bear security.

Prohibiting major activities in displacement areas will not result in an increase of total habitat for bears, but will improve the availability of secure habitat that otherwise might be impacted by other projects during the life of the project. The proximity of secure habitat in BAAs adjacent to those disturbed should provide usable habitat, particularly spring habitat for bears displaced by mine activities. The displacement schedule is displayed in pages 98 and 99 in the BA. The BA presumes no major activity will occur in these BAAs over the 35+ year-life of the mine.

However, the large number of private mineral patents and claims in the area and the Kootenai's past interpretation of ANILCA, suggest that this premise might not be correct if private land owners request access.

Opening Size

The Forest Plan standard or associated assessment criterion is to design harvest units to be 40 acres or less. If exceeding 40 acres under justifiable reasons, no point in the resultant opening should be more than 600 feet from cover (maximum 1,200 foot across).

The mine facilities and tailings pile openings fail to meet this Forest Plan standard. Approximately 468 acres of grizzly bear MS 3 and MS 1 habitat are proposed for permanent conversion to non-bear habitat for the 35+ year operation of the Project (BA). The largest opening proposed is in MS-3 habitat (368 acres) for the construction and operation of the tailings impoundment. The remaining portion of the surface disturbance includes 115 acres of MS 1 habitat for the mill site and associated facilities; the exploration adit and supporting facilities; and road construction/reconstruction.

Movement Corridors

The Forest Plan standard or associated assessment criterion is to maintain unharvested corridors at least 600 feet wide between forest openings or natural openings. Functional hiding cover has a minimum of three sight distances (after harvest), where a sight distance is the mean distance at which 90 percent of an animal is hidden from view.

The Rock Creek Project would result in achieving the goal of maintaining a minimum of 600 feet between proposed openings. However, the effectiveness of movement corridors within and adjacent to the Rock Creek Project area and associated habitat will be significantly impacted. The presence of new facilities (on-site) and housing (off-site), large increases in motorized traffic levels, and anticipated increases in motorized and non-motorized recreation due to improved access coupled with increased awareness of recreation areas as a result of mine publicity will increase disturbance to bears and may significantly increase mortality risks.

Effective cover will be compromised by the increased traffic on the main access road, FDR 150, which has a predicted 1,120 percent increase during construction and a 300 percent increase during operations as compared to baseline conditions. FDR 150 would primarily impact cover between BAAs 761, 752, and 747. Existing cover areas also may be impacted by the increased recreational use anticipated with the influx of 380 miners and family members and up to 180 additional community members not directly associated with the mine. (See Effects- Other Factors). The project includes Conservation Measures in terms of a transportation plan reducing traffic, including busing employees to the mine facilities that will address these impacts, in part. The 1,120 percent increase assumes the transportation plan is in effect and is effective. Actual use may be greater than predicted.

Seasonal Habitat Protection

The Forest Plan standard or associated assessment criterion is:

1. Spring habitat protection—Objective is to schedule activities within spring habitat (southerly aspects less than 5,000 feet elevation) outside spring season (April 1-July 15).

2. Den site protection—Objective is to allow activities within one-half mile of known den sites only outside the denning season (November 15-April 1).

The BMUs 5 and 6 contain designated roadless areas in high elevation bear habitats within the Cabinet Mountain Wilderness Area. The BA reports that a total of 26,822 acres of spring habitat components are present in the BAAs affected by the Rock Creek Project (747, 752, and 761). Much of the available spring habitat in the other BMUs in the area is already impacted by the nearby Montanore mine. No seasonal avoidance of important spring habitats can be incorporated into the mine activities since the mine is planned to run year round, 7 days a week, and several shifts a day.

The elevation and development pattern of the area suggest that there would be a net loss of available spring habitat to bears for at least the life of the project, if not perpetually. Displacement BAAs were analyzed for like habitat by aspect and elevation (Table 16 and 17 BA). The analysis indicated that more than one BAA would be required to provide displacement habitat for BAA 7-6-1 and 7-4-7. These displacement BAAs would have no major activity within them for the life of the Rock Creek Project (except for the portions of those BAAs already classified as MS-3 habitat).

Proposed mitigation requires habitat enhancement of 484 acres. In addition, there are 7 acres of wetland creation planned to mitigate impacted wetlands. The wetland that will be lost due to the tailings pile is currently MS-3 habitat and is already impacted by high road density. Although not specifically addressed as grizzly bear habitat, the loss of these wetlands, most occurring below 5,000 feet, would be considered a loss of spring habitat that may not be replaced by "created" wetland habitat. "In kind" replacement was identified in the mitigation plan to address specific habitat unit loss and would cover 2,350 acres of fee acquisition or conservation easements.

Denning habitat is not expected to be impacted by this action (BA page 23).

Effects - Habitat-ITS

Open Road Density

The ITS term and condition is no net increase in Open Road Density. See Open Road Density under Effects–Forest Plan Standards or associated assessment criterion.

<u>Total Motorized Route Density</u>

The ITS term and condition is no net increase in TMRD.

The ITS standard of no net increase of OMRD would be achieved in BMU 4 and 6 by implementing the proposed road management plan (see Description of the Rock Creek Project). Table 11 displays changes resulting from the Rock Creek Project. The OMRD in BMU 4 and 6 decreases during the action and complies with the ITS. However, BMU 5 increases from 29.2 to 30.1 and does not comply with the ITS. The goal of no net increase for TMRD will be achieved in BMU 4. The BMUs 5 and 6 fail to comply with the ITS and would experience a net increase in total road density (Tables 10). The BMU 5 would increase from baseline TMRD of 22.3 to 24.1 percent (1.8 percent increase) and BMU 6 from 34.1 percent to 34.6 percent (0.5 percent increase).

Table 11. Bear Management Unit Moving Windows Analysis of Alternative 5 Changes to Total Motorized Route Density and Open Motorized Route Density from the Current (1998/99) Baseline. From U.S. Forest Service 1998. (BA)

	TOTAL MOTORIZED ROUTE DENSITY % OF THE BMU HAVING TOTAL ROADS GREATER THAN 2 MILES PER SQUARE MILE		**OPEN MOTORIZED ROUTE DENSITY % OF THE BMU HAVING OPEN ROADS GREATER THAN 1 MILE PER SQUARE MILE**	
BMU	Pre-Project	During	Pre-Project	During
BMU 4	28.1	25.7	39.0	37.2
BMU 5	22.3	24.1	29.2	30.1
BMU 6	34.1	34.6	34.3	33.7
BMU 7	21.7	16.0	24.8	24.7
BMU 8	22.2	22.2	42.5	42.5
BMU 22*	42.0	38.0	41.0	40.0

Information from Tables 9 and 10 in the BA, as amended August 3, 1998 (Wayne Johnson October 2000)
* Improvements result from road closures on Beatrice, Canyon Face and Weeksville. Tricia O'Connor, Lolo Biologist, January 19, 2000.

The Rock Creek Project road closures proposed under the Description of the Rock Creek Project, keeps TMRD in BMUs 4 and 5 to below the levels reported by Wakkinen and Kasworm (1997), who found a TMRD of greater than 2 miles per square mile in 26 percent of an average female home range, based on the eleven female bears studied. The OMRD and TMRD in BMU 6 exceeds this level of road density at baseline and afterwards. The TMRD in BMU 5 and 6 increases during the project and remains high afterwards, but TMRD goes down in BMU 4 during the project. These effects of the Rock Creek Project do not include any improvements to OMRD and TMRD that may be possible following acquisition of mitigation properties, since the location and road situation associated with these properties have not yet been identified.

The OMRD decreases during the project in BMU 4 and 6, but remains above the OMRD of greater than 1 mile per square mile in 33 percent of an average female home range reported in Wakkinen and Kasworm (1997). The OMRD in BMU 5 increases during the project, but stays below the reported levels.

According to the Kootenai's annual Forest Plan monitoring reports (Table 8), OMRD in 9 of 17 of the BMUs on the Kootenai are below levels reported in Wakkinen and Kasworm (1997), OMRD of 33 percent of a home range exceeding 1 mile per square mile. Note that OMRD in the 1999 report indicates that BMU 4 is over 33 percent. The OMRD in BMUs that have more than 1 year of annual reporting data show that 9 of 17 BMUs have improved (OMRD declined) since 1997. The OMRD in BMUs 4 and 10 remained the same, and the OMRD in BMUs 11, 13, and 14 have increased.

The TMRD is at or below levels reported in Wakkinen and Kasworm 1997 (26 percent of a home range exceeding 2 miles per square mile) in 13 of the 17 BMUS. All of the BMUs that have more than 1 year of annual reporting data show improvement (decline) in TMRD since 1997.

<u>Core Area</u>

The ITS requires no loss of core habitat.

The Rock Creek Project does not result in a further reduction of baseline core according to the BA, provided that current trails with low use do not experience use levels that would significantly displace bears and affect core and complies with the ITS.

Core is 49.9 percent in BMU 6 (from projects other than the Rock Creek Project). The Service is concerned about a reduction in effective core habitat if human use increases to levels that cause the Rock Creek or St. Paul Trails to reach levels known to significantly displace bears. Wakkinen and Kasworm (1997) documented core levels of 55 percent in successful female home ranges in the CYE. Although the ITS does not require 55 percent as a requirement, it does encourage improvements in habitat security based on research conducted by Mace and Manley (1993). The SCYE Access taskforce working group, part of the committee mentioned in the ITS, developed a goal of achieving 55 percent core in Priority 1 BMUs. BMUs 4 and 6 are Priority 1 BMUs, but the BA contains no strategy to achieve 55 percent core area (Table 12).

Direct habitat loss would remove 483 acres from the CYE recovery zone as a result of the Rock Creek Project. The BA determined that displacement (assuming 1/4-1/2 mile around physically disturbed sites and human travel routes) would impact another 6,420 acres, essentially removing this area as available bear habitat for a period of time exceeding 35 years.

The Kootenai calculated core habitat of 60.2 percent, 60.7 percent, and 50.5 percent respectively in BMU 4, 5, and 6 prior to the Rock Creek Project (BA). The BA identified that core habitat in BMU 6 decreases to 49.9 percent during the project, but explained that the analysis included calculations to determine core impacts from Montanore. Montanore was proposed in 1993 before OMRD, TMRD and core calculations were used to analyze secure bear habitat. Table 12 displays the baseline core levels as a result of this analysis. Existing core in Priority 1, 2, and 3 BMUs would change as shown (Table 12), but the Rock Creek Project would not be responsible for the reduction in the available amount of core habitat in any of the BMUs during construction or operation of the Project.

The BA states that BMU 5 is impacted by the ventilation adit in the wilderness area. The BA states the adit is located in a cliff, that the cliff is not currently usable by grizzly bears, and that the noise level from the adit will be low since fans will be deep in the adit, and therefore concludes that there would be no loss of core. The ventilation adit would be evaluated at the time it is needed (and if it is needed) to determine alternatives and to ensure latest technology is incorporated. Currently the adit is predicted to effect a surface area of 800 square feet (SEIS). The adit portal size would be approximately 15 feet by 15 feet (Dave Young, Sterling official, in litt. 2000). It would be accessed from underground, and some rock might be expelled to the surface. The fans would be installed well below the surface and would be estimated to be less than 45dBA more than 50 feet from the adit. Neither the IGBC (1994, 1998) nor the Rule Set addressed this type of impact to core. The wilderness ventilation adit may not be needed, and if it is, the Kootenai will assess the situation at that time.

Table 12. Core area changes in BMUs affected by the Sterling Rock Creek Project.

BMU	PERCENT OF BMU IN CORE PARCELS LESS THAN 4 SQUARE MILES (BASELINE)	TOTAL CORE 1998	TOTAL CORE 1999	TOTAL CORE 2000+
4	5.3	60.2	60.2	60.9
5	4.1	60.7	60.2	60.2*
6	9.8	51.0	50.5	49.9*
7†	1.1	65.0	65.7	
8†	3.3	54.0	56.9	

* The reduction of core habitat in Bear Management Units 5 and 6 is due to private land activities (Plum Creek and Montanore) and is not due to the Sterling Rock Creek Project (Wayne Johnson, pers. comm. November 8, 2000). When Montanore was evaluated, core impacts were not calculated. The impacts of Montanore were calculated in the BA to establish baseline conditions for the Rock Creek Project (Wayne Johnson, Kootenai biologist, pers. comm. November 29, 2000).

† Data from Annual Monitoring Reports (U.S. Forest Service 1999, 2000).

EFFECTS: OTHER FACTORS

Human Impacts

One of the greatest impacts on grizzly bears resulting from the Rock Creek Project is the 375 employees directly associated with the mine and their families, and another 180 support people coming to the area to live, work and recreate in this currently remote area. Although it is expected that some local people already in the area would fill some of these jobs, the ingress of additional people will be significant. With people come additional demands for housing, access, utilities and facilities. It is likely that some of the new residents will build on currently undeveloped private land in or near the CYE, increasing the permanent loss of habitat, although this will not affect the amount of MS-1 habitat. The BA predicts an estimated 150 acres (EIS, Chapter 4) could be developed. Increased problems with sanitation, noise, habituation and displacement are associated with such use.

The Rock Creek Project will result in increased traffic levels on the access and service roads. The BA predicts traffic levels will increase 1,120 percent over pre-project levels on FDR 150 during the 7-year construction period. Traffic would remain 300 percent above existing traffic levels during the 35-year operation period. Traffic along Montana Highway 200 also would increase significantly, but since this is the boundary of the recovery zone, it is not addressed specifically. A transportation plan to minimize vehicular traffic is proposed but the BA does not specify the extent that impacts could be minimized by the plan.

The Project also would result in an increase in the average vehicle speed due to the proposed paving of the main access road and several spur roads within the Project Area. Mortality risk to bears would increase for bears attempting to cross FDR 150 as vehicle speed increases, but the Service is uncertain if this presents a significant mortality risk in this area. Mortality resulting from collisions between grizzly bears and vehicles has been documented (IGBC 1987), but avoidance of important habitat and the altering of natural movement patterns around roads and increased human-bear exposure is a bigger concern. The avoidance of human activity can keep a bear from important habitat to the extent that significant adverse changes in normal movement patterns would impair successful reproduction and feeding and sheltering. Monitoring could help to determine if the increased traffic volume and speeds is a significant direct mortality risk, and if so, the issue would be revisited.

Hunting and casual recreational use is expected to increase in the Noxon, Montana, area significantly with improved access, more public attention on the area and increases in people working at or living near the mine. More hunters increase the potential of mistaken identity deaths to bears not used to such high human activity. Additional people increase the potential of illegal activity such as poaching, as occurred when Montanore was opened and some workers associated with the mine were convicted of poaching deer (Wayne Kasworm, pers. comm. 2000). From past experience, Montana Fish, Wildlife and Parks has found that poaching incidents tend to increase during construction activities. The spike in illegal activities seems to correlate with transient work forces that work "around-the-clock" schedules, but tends to decline once construction is complete and the stable work force is in place (Mark Soderlind, Montana Fish, Wildlife, and Parks Biologist, pers. comm. 2000).

Use of the Rock Creek Trail along the East Fork of Rock Creek is expected to increase significantly with the improvement of access, greater publicity and increased people moving to the area. This trail would be accessed by the improved road to the mine and would be expected to attract greater use once the road is improved. Currently the trail is considered low use, and as such is not buffered out of core or habitat effectiveness.

The Service is concerned about a reduction in effective core habitat if human use on the Rock Creek or St. Paul Trails increases to significantly displace bears. The BA predicted, based solely upon a portion of the anticipated influx of Project employees and their family members recreating during the Project, that the Project would result in a 31 percent increase over the current (actual) use levels, ranging from 14 to 35 parties per week. The Service believes that the average 18 percent annual increase in reported general recreation use of the trail from 1990 to 1996 is likely to continue for at least part of the next 35 years. If the existing use exceeds 20 parties per week, then trail use would be considered high, and significant displacement of bears away from the area as well as increase the chance of adverse human-grizzly bear interactions could occur, and would result in a decrease in core habitat.

Sanitation

The Rock Creek Project area is currently a relatively remote area, and most people live along the main roads and small towns. The Rock Creek Project will significantly increase the number of people working, recreating and building homes. The influx will occur over a very short time frame once the mine begins hiring. Some of these people will have no experience in bear country. Some people may have anti-bear attitudes, or may be prone to poor compliance with sanitation recommendations. Any bears in the area will be exposed to a significant and rapid increase in garbage, and other household attractants, without much opportunity to adapt.

Mitigation for the Rock Creek Project addresses these problems in several ways: garbage at the facilities will be stored in garbage proof containers, Sterling will share the support of a wildlife education position to help educate both mine personnel, their families and other people in the area about how to live and recreate safely with bears and when and if education fails, Sterling will support a wildlife enforcement position to reduce the potential of poaching or illegal activities with wildlife and to deal rapidly with situations that may arise.

The Kootenai currently addresses sanitation issues by providing educational materials about living safely with bears at the Ranger Stations and occasionally provides educational programs on wildlife. On the negative side, the Kootenai does not currently have a forest-wide food storage order that requires forest users to keep their food properly confined, only some campgrounds have bear-proof garbage containers, and funding for proactive education programs is not always available. Many of the activities associated with the Rock Creek Project will occur on private lands which are beyond the jurisdiction of the Kootenai or Sterling.

To prevent problems, sanitation issues must be addressed before grizzly bear incidents occur, and should any incidents occur, they need to be dealt with immediately to avoid escalation of the situation. Grizzly bear resistant garbage facilities should be in place prior to problems. Educating people on how to set up their home sites or camp sites to avoid attracting bears is most effective prior to problems arising, not after a bear has found a food source. Education and enforcement must be a constant presence, and good sanitation information needs to be regularly reinforced and the law enforcement and education positions to be funded by Sterling as part of the mitigation of the Rock Creek Project are extremely valuable in reducing these concerns (see Effects-Habituation/Food Conditioning).

Full-time, year-long education and enforcement personnel can help in community diligence and education. The mitigation plan addresses some of these details with these positions, but does not necessarily ensure that--(1) the funding for education and enforcement positions will be adequate for well-skilled full-time professional staff (including benefits), (2) the funding for these positions will ensure that Montana Fish Wildlife and Parks creates new positions and clearly defined duties to specifically deal with the increased intensity of the Rock Creek Project and Montanore and are in addition to the staff already in the area, (3) these personnel are established prior to the influx of people to the area for work on the evaluation adit, construction and production phases of the mine, (4) the duties of these personnel include monitoring black and grizzly bear-human encounters and how these situation were handled, and (5) these personnel will remain in place during temporary shutdowns and for a reasonable amount of time following reclamation to maintain continuity in monitoring and handling incidents.

Noise

Blasting during adit construction would generate sounds up to 125 dBA within 900 feet of the blast and 60-80 dBA within the Clark Fork Valley and the Cabinet Mountains Wilderness and could be heard up to a mile or more away (SEIS, page 4-154). Construction equipment would generate sounds up to 100 dBA within 50 feet. Mine operations noise of 52-62 dBA would exceed baseline conditions. The conveyor, crushing plant and ball mill are the loudest continual disturbances, and will be heard up to a mile or more away (SEIS, page 4-154). Traffic noise on FDR 150 would increase from 30 to 70 dBA. Should a wilderness ventilation adit be required in the future, Sterling will be required to evaluate the latest technology and alternatives at that time. If installed as planned today, the fan for the adit would be installed fairly deep in the adit to reduce surface noise. The fan would be 45 dBA measured at 50 feet from the adit (Kathy Johnson, Montana Department of Environmental Quality Project Leader, pers. comm. 2000). The cumulative effects of the Rock Creek Project and Montanore would increase the acreage within the CYE where human sounds are noticeable, but would not have noise overlap (SEIS, page 4-155).

The effects of short-term intense noises on bears has incidentally indicated some bears may respond by avoiding the disturbance, and some bears may experience slightly elevated heart rates (see Status-Life History). Significant bear avoidance of roads and their associated activity is well-documented (see Baseline and Effects-Displacement). Individual bears may not display a measurable response such as movement. Bears may adapt to consistent, repetitive noise provided that food availability and quantity are not reduced and adverse encounters associated with the noise do not occur. However, the influx of people, vehicles and other activities is more likely to effect displacement of grizzly bears in surrounding habitat. The Service expects that avoidance of the areas by grizzly bears due to excessive noise would occur, particularly along the roads and main facilities. Thus, habitat would essentially be unavailable to grizzly bear for the life of the mine and well beyond (see Effects-Habituation, Fragmentation/Loss of Habitat).

Associated Access and Facilities

A 230 kV transmission line would parallel FDR 150 from Montanore 200 and follow other access roads to the facilities. A utility corridor also follows established roads to include the tailings slurry pipeline (16- to 24-inch), ore concentrate pipeline (3-inch), mine discharge pipeline (12- to 14-inch). Pipelines would be buried except for stream crossings. Most of these activities would be covered under mitigation acres and road impacts, although the impacts during construction phase of installing the line and pipeline would be significantly greater than the construction of a standard forest road. Most of the buried pipes will be left in place during reclamation and the potential of eventual collapse is not addressed. The transmission line will be removed after reclamation. As proposed, a mixture of native and non-native plants will be used for revegetation and reclamation. Fertilizer and organic matter may be optionally added to stockpiled topsoil.

Fragmentation

Addressed under Effects-Habitat loss and fragmentation.

Impacts to Grizzly Bears Resulting from the Effects of the Rock Creek Project

Habitat effectiveness is measured by buffering out roads, logging activities, and other highly disturbing human activities in order to identify the remaining secure habitat, is one measure of the impacts of access on bears. Core and BAA displacement analysis are other measures that reflect this impact. These standards provide an indirect measurement of the degree to which a bear must change normal routines in response to human disturbance. The change of normal routine may be a change in diurnal patterns, avoidance of preferred habitat, elevated heart rates or other factors related to stress or fear, movement into already occupied habitat increasing chances of adverse intra-species interactions–including predation on cubs, or reduced food-gathering ability that could result in reabsorbed fetuses or poor cub and sub-adult survival. All of these changes have been documented in grizzly bears (IGBC 1987). Clear cause-effect relationships have not always been statistically validated, although similar responses have been documented in other animals. Many grizzly bears under-use or avoid otherwise preferred habitats that are highly influenced by humans. These impacts can be summarized in three general categories: Displacement from Essential Habitat; Habituation/Food Conditioning Leading to Increased Mortality Risks, and Habitat Loss/Fragmentation.

<u>Displacement from Essential Habitat</u>

There are 20 BAAs affected by the Rock Creek Project. Twelve of those 20 BAAs, or 60 percent, would be active at some time during the life of the mine by the Rock Creek Project or other currently approved projects (Table 6). The Rock Creek Project will affect four BAAs, or 20 percent, for an extended period of time, and Montanore will affect an additional three BAAs for a similar length of time. Access to the numerous patented and unpatented mineral claims and access to private inholdings are other projects that permanently impact an additional BAA. Within the three BMUs affected by the project, 40 percent (eight BAAs) would be have long-term or permanent activity. The Service believes this represents a potential for significant displacement effects on grizzly bears using these BMUs.

The BA predicts that bears would be displaced from the project area’s influence zone, 7,044 acres, although some of this area is already impacted by human activity along the Clark Fork River. Long-term displacement from MS 1 habitat would likely occur as an indirect effect from high-intensity human activity. Avoidance of this area is likely to be taught to cubs by their mothers, extending the displacement for an unknown period of time after the mine is reclaimed, even if reclamation is successful at restoring habitat.

The displacement BAAs 745, 746, 753, 762 and 763, which are offered by the Kootenai to mitigate the Rock Creek Project, have a calculated ORD of zero, but actual road densities may be much higher because ORD does not include roads in MS-3 habitat or private lands. A low calculated ORD does not assure that these areas are undisturbed, road-free or good habitat. ORDs are low in some of the displacement BAAs because some are high elevation wilderness or roadless areas that have large amounts of rock and ice and have little good quality bear habitat. Some of the greatest road density occurs on MS-3. Therefore, displacement BAAs offered by the Kootenai may not provide the habitat security necessary for bears displaced by the Rock Creek Project.

Negative association with roads arises from the bears' fear of vehicles, vehicle noise and other human-related noise around roads, human scent along roads, and hunting and shooting along or from roads. Grizzly bears that experience such negative consequences learn to avoid the disturbance and annoyance generated by roads. Such animals may not change this resultant avoidance behavior for long periods after road closures and lack of negative reenforcement. Displacement of bears away from preferred habitat is a factor of bears avoiding people who shoot at bears (legal harvest, defense, mistaken identity or malicious) and avoidance of the disturbance related to people, noise, activity, roads and traffic. Dood et al. (1986 but cited as 1985 in IGBC 1987) found that 32 percent of all known Montana grizzly hunting mortality and 48 percent of all known grizzly non-hunting mortality prior to 1985 occurred within 1 mile of a road. Others documented significant displacement from roads except under certain circumstances (IGBC 1987).

Grizzly bears may avoid good habitat next to roads except in poor food years when they may be forced to seek those resources at higher risk to their safety. In most years, avoidance of roads would result in a significant loss of habitat. Bears that avoid human activity may be forced into poorer quality habitat or habitat that is already occupied by other bears. Bears that are forced out of their familiar home range also utilize more energy finding shelter, food and den sites than bears within their undisturbed home range. Bears prevented from using important resources in their home range due to avoidance of roads or other disturbances could experience impacts affecting breeding, feeding and sheltering to the extent that significant changes in behavior, or take, would occur.

Grizzly bears also avoid high use trails and other disturbances, but there is little in the literature that establishes a threshold of tolerance of bears to increased trail activity outside of national parks where recreationists do not carry firearms. Kasworm and Manley (1990) found that grizzly bears in the Cabinet mountains used the 0-274 meter strip (approximately 899 feet) along trails 42 percent less than expected, based on availability. This pattern was consistent among the three grizzly bears analyzed. Distances greater than 3,322 meters (slightly over 2 miles) from the trails were used greater than their availability by one bear and the other two used it as expected. Actual use of the trails by hikers was not monitored in this study.

Female grizzly bears, in particular, have a strong home range affinity in response to disturbance (IGBC 1987). They may avoid preferred habitats, but have not been documented to vary from established home ranges to a significant degree. The reasons for this affinity are not completely understood, but may be related to how grizzly bears find and follow the phenological development of important food plants in their habitat, returning predictably to important habitats such as huckleberry fields in the fall or avalanche chutes in the spring. Bears appear to "learn" their home range, which often expands as a bear matures, but usually maintains a central common core zone. Bears often learn their habitat from their mothers, with home ranges of young, usually female young, often bordering or overlapping that of their mothers.

Exploratory movements into unfamiliar territory can be expensive in terms of energy expenditure and the low potential of finding good unoccupied habitat in the proper phenological condition to support the high caloric requirements of bears in the feeding season. An adult grizzly bear consumes up to 20,000 calories a day in preparation for denning. Lactating females may require even greater calorie intake. Elevated heart rates resulting from disturbance or noise, or the increased calorie expenditure searching for food or protective cover in an unknown area can cause a significant impact on breeding, feeding or sheltering, possibly to the extent that reproduction is compromised. Females with cubs are not as able to travel, limited by the need to feed and accompany the cubs. Predation by adult grizzlies also is a threat. Bears moving into unknown territory give up known escape cover and increase their chances of encounters with male bears.

The mitigation plan suggested conservation easements for approximately 50 years (figured by the Kootenai as 35 years of the life of the mine plus two bear generations after the closing of the mine), or for direct fee purchase of private land to be managed as bear habitat. The acquisition of property that is secure for grizzly bears is important to help compensate for the displacement resulting from the mine and associated activity. A term easement could create an unintended mortality sink if, at the end of the easement period, the land changed from a secure zone to a developed property with risks of habituation, control actions and other human-caused mortality. Property within or adjacent to wilderness areas would have significant appeal to developers at the end of a 50-year time frame. It is reasonable to expect that land use would change if such a change were not restricted.

The BA presumes that grizzly bears would readily re-inhabit heavily-disturbed habitat after the disturbance is removed, within two bear generations. The Service is unaware of any literature that supports this premise. Grizzly bears are strongly-adapted to their habitat and are typically trained by mothers for several years about use and avoidance of that habitat. Such training may be passed from generation to generation through the maternal parent. Grizzly bears may not readily reclaim previously intensely-developed areas that were avoided for 35+ years.

One presumption of displacement areas is that the areas into which grizzly bears would be displaced is not already occupied by other bears (or that adequate resources are present to support more than one bear). Given the current small population of grizzlies in the CYE, this may be a safe assumption for the short term. However, if recovery efforts are successful over the 35+ years of the project, displacement habitat alone may not meet the needs of a recovering bear population. Another assumption is that the displacement areas would meet the habitat conditions necessary for displaced bears and that bears would actually use displacement areas outside their established home range. In some cases grizzly bears would likely attempt to remain and survive in a home range area impacted by activity.

Displacement of grizzly bears from established home ranges into other habitat comes at a high cost to an animal that is highly-dependent upon learned food sources. Bears, particularly females, typically learn how to use their habitat areas from their mothers. Moving into new territory requires more exploratory time to learn the most productive feeding areas and exposes the new bear to greater risks of predation by male bears or exposure to humans. The change in traditional behavior also increases the chances of a bear encountering human food sources that can lead to habituation and the necessity of control actions. Transition from one area to another takes time for adjustment.

The area encompassed by the four mines described previously shown in the BA (BA Appendix 10) is approximately 12,238 acres and largely within the Cabinet Mountain Wilderness. It contains about 50.4 percent (6,144 acres) of either sparse (661 acres) or no hiding cover (5,483 acres). The remaining acreage (6,094 acres) contains the best hiding cover, but also is located in close proximity to human activity areas associated with the Project and the other existing approved mining projects

The high level of activity (7 days a week, up to 24 hours per day) at mine facilities and near adits suggest a level of disturbance much higher than the .5 mile buffer allowed for habitat effectiveness or .3 mile buffer for core. Topography in the area suggests that actual displacement of grizzly bears might occur as far as from ridgeline to ridgeline or more, displacing bears from the immediate valley drainage.

The Rock Creek Project is likely to displace grizzly bears from the active project area, the access roads and utility corridors, highly-used trails and other unforseen recreational areas, and possibly the surface conveyor that carries waste products from the exploratory adit to the mill site prior to the underground adit reaching this location. Habitat effectiveness is below the minimum considered by the Kootenai to provide habitat security for bears prior to the action and habitat effectiveness fails to meet the Forest Plan or assessment criterion throughout the 35+ years of the Rock Creek Project. The TMRD and OMRD increase as a result of the project. Core remains low in one BMU, as a result of Montanore mine, which was analyzed to establish proper baseline for the Rock Creek Project. The Rock Creek Project does not reduce core due to closures that will be implemented as part of the Rock Creek Project. However, measured against parameters reported by Wakkinen and Kasworm (1997), the baseline does not currently reflect access conditions were known to support female grizzly bears studied in this ecosystem.

High TMRD, OMRD, and low core result have been recognized by the Service to cause significant impairment of breeding, feeding and sheltering of bears due to bears being displaced from preferred or essential habitat that is heavily roaded (U.S. Fish and Wildlife Service 1995). High linear ORD and large exposed opening sizes also contribute to displacement of bears away from preferred habitat–particularly spring habitat (ITS). This displacement would be long-term and where it occurs along established roads and mine facilities, could be permanent.

<u>Habituation/Food Conditioning Leading to Increased Mortality Risks</u>

Human-bear interactions generally lead to three negative outcomes that all lead to death or removal of the bear from the population:

1. habituation, when a bear loses its natural caution around humans, often resulting from food conditioning, leaving the bear vulnerable to illegal shooting;

2. encounter situations where humans kill bears due to real or perceived fear of life or property situations; or

3. management control actions where a bear is killed or moved to avoid threats to humans or their property.

Continued exposure to human presence, activity, noise, food, etc., without negative consequences can result in habituation, the loss of a bear’s natural wariness of humans. Some bears, particularly subadults, more readily habituate to humans and consequently suffer increased mortality risk. Habituation in turn increases the potential for conflicts between people and bears. Habituated grizzly bears that obtain human food rewards often become involved in nuisance bear incidents, and/or threaten human life or property. Such bears generally experience high mortality rates. They are eventually destroyed or removed from the population through management actions, or are more vulnerable to illegal killing because of their increased exposure to people. In the Yellowstone region, people killed habituated bears over three times as often than non-habituated bears (Mattson et al. 1992). Bears are highly individualistic. Some can become conditioned to disturbance with little to no significant adverse effects, while others can become problem bears. Association with people invariably leads to a similar end, although individual situations may vary. Bears that do not avoid human activities are more vulnerable. Bears close to roads or human habitation are more likely to be shot, food habituated, hit by cars, or removed by control agents to reduce risks to humans or their property. The end results is removal of the bear from the ecosystem.

Access and interaction with humans plays an important role in contributing to grizzly bear mortality. Fifty percent of the human-caused grizzly bear mortalities from 1982-1999 in the CYE were within 500 meters of an open road (Wayne Kasworm, pers. comm. 2000). Hunters and poachers were another significant factor in human-caused deaths. Six of 11 human-caused mortalities from 1982-1999 resulted from defense of life situations or hunters who mistook the grizzly bears as a legal animal. One of the 11 was a male killed legally by a hunter in British Columbia in 1988, 3 were illegal killings, 1 was a predation related to trapping, and 1 was a management removal for public safety (Appendix B).

Attraction of grizzly bears to improperly stored food and garbage is identified by the Recovery Plan as one of the principal causes of grizzly bear mortality. One grizzly bear was killed (in 1999) because of sanitation related problems in the CYE during the period from 1982-1999. The bear followed classic habituation behavior, first feeding on compost and bird seed and eventually breaking into outdoor refrigerators and attacking a goat. The incidents occurred in a small rural subdivision which had covenants against keeping livestock, but the covenants were not enforced. An unknown bear, possibly the bear that was eventually killed, had gotten into a “bear-proof” garbage container earlier in the summer when the lid was malfunctioning and probably obtained food rewards.

For bears that are not displaced from trails and the habitat around it, increased trail use also leads to increased chances of bear-human interactions. The BA states that the Rock Creek Project might increase the mortality risk to grizzly bears from illegal shootings and defense of life confrontations during the hiking, camping, and hunting seasons. Confrontations between bears and people would be expected to increase due to the anticipated high use (non-motorized) of the Rock Creek Trail along the East Fork of Rock Creek, the greater number of people moving to an area that was previously sparsely populated, and greater chances of food conditioning or other types of habituation resulting from additional residences.

Over 350 people including miners and their families associated with the mine and up to 180 support people are predicted to be in the area during operational periods. Such ingress of people will likely result in some level of sanitation- related conflicts with grizzly bears.

The potential for habituation can be reduced by education and adherence to good sanitation efforts, including proactive measures such as fencing and securing attractants. The education and enforcement positions are instrumental in meeting this objective, but it is essential that these activities be consistent, the personnel involved live in or near the area to develop a relationship with neighbors, and be long-term. It is important that these positions precede the influx of workers so that pre-emptive planning can occur and education programs be in place when workers and their families move in. Likewise, these positions should be retained for as long as the impacts resulting from the mine are occurring. Short-term mining shutdowns may not remove the impacts from the additional people in the area associated with the mine.

To be effective, these positions should be located in the vicinity, specifically deal with the Rock Creek Project mitigation issues, and include threatened and endangered species issues. The information and education specialist position should include duties comparable to the existing grizzly bear management specialist positions within the Montana Fish, Wildlife, and Parks.

<u>Habitat Loss/Fragmentation</u>

The mitigation plan provides for 2,350 acres of on- or off-site replacement habitat to compensate for the disturbed area and an additional 100 acres of on-site mitigation to provide alternative habitat to that habitat disturbed by increased recreational use associated with the Rock Creek Project. The mitigation habitat also addresses the disruption of bears using the north-south movement corridor in the Cabinet Mountains. Although the mitigation plan provides "replacement" habitat for that lost to the mine through surface disturbance or habitat displacement, the mitigation plan does not create any new habitat. It rather puts a protective status on habitat that, if undeveloped, may already be used by grizzly bears to prevent future decay. The net results is a short-term loss of "real" habitat to bears, but a potential maintenance in protected habitat over the long-term.

The BA assumes that displacement from 24-hours a day, around-the-clock high noise activities would be similar to displacement documented for traditional forest management activities, and habitat made "unsuitable" due to disturbance would be calculated in the same way. The Service believes that actual displacement may occur for several miles into the drainage and from ridge to ridge surrounding the mine and facilities. This would be a significantly greater area "lost" to bears than the displacement plan and mitigation habitat address.

The BA presumes that such heavily-utilized habitat can be reclaimed to meet the conditions that make it suitable for bear utilization. The Service is unaware of data that demonstrates that restoration habitat will provide all of the same functions for bears as pre-project habitat. Providing secure habitat during the life of the mine through temporary conservation easements may be just long enough for generations of bears to learn that these areas are "safe." Removing easements at that point, even if the mine activities have ceased, leave that habitat vulnerable to a wide variety of private activities that are adverse to bears and may actually increase the risk of mortality to bears. Permanent acquisition or permanent conservation easements, with land managed as MS-1 habitat, would ensure that habitat acquired to provide undisturbed suitable habitat for bears would continue to remain undisturbed after bears become adapted to it.

The Service anticipates that the removed habitat should re-establish forest structural conditions within 30 years following reclamation. Functional natural habitat may not recover that rapidly, if ever, due to loss or disturbance of topsoil, seed source, soil biota, compaction and the addition of non-native materials including weeds, exotic reclamation seed, and/or building debris and waste products that are not totally removed. Some permanent loss of habitat is expected as a result of this project. Complete restoration of native vegetation in pre-project quantity, quality, diversity, function and distribution would probably be impossible.

The Rock Creek Project, when coupled with Montanore and other projects in the Cabinets, would create a strip across BMU 5 and 6, that could partially sever the lower third of the Cabinet portion of the CYE from the rest of the CYE (BA Appendix 10). Should private patents get developed or used in a way that displace or threaten bears, the fragmentation would be even more significant. The BA states that "complete" fragmentation is not likely from the Rock Creek Project and other activities in the CYE, but an estimated 31 percent of the CYE bears may be forced to change traditional movement patterns and behaviors.

Although not a complete barrier to movement throughout the ecosystem, disturbance and lost habitat would significantly reduce the safe movement and dispersal of bears moving north and south along the Cabinets and may deter some bears from risking this exposure. In addition to the actual mine facilities and adits, access roads to the mine and general access in the area will increase significantly. A powerline, with a wide corridor of maintained open vegetation underneath, crosses nearly half of the CYE and is included in the Montanore project. Development of land around the MS-3 habitat in the center and along the edges of the CYE continues to erode the adjacent MS-1 habitat. These impacts, due largely to an increasing human population and greater "sprawl" of residences, will continue to threaten this population. People coming to the area because of real or perceived opportunities associated with the Rock Creek Project will accelerate the fragmentation, probably permanently.

Fragmentation can significantly reduce or eliminate successful dispersal or occasional migration, as well as increase risks to bears moving through insecure areas. Significant impacts to breeding, feeding and sheltering would be expected. This can be a significant long term adverse effect to the CYE, possibly leading to jeopardy of the continued existence of the population. The BA addresses the fragmentation issue by requiring displacement habitat, and by providing displacement BAAs. Displacement BAAs would have no major activities during the life of the mine, but does not address MS-3 habitat that may currently be in these displacement BAAs.

Grizzly bears that are deterred from traveling to preferred feeding areas may experience reduced weight gain and increased risk of starvation or reduced reproduction (See Effects-dispersal). Altering preferred travel patterns either results in bears using less optimal habitat, or using more resources and traveling farther to get to suitable habitat. If young bears, typically subadult males, are deterred from dispersing through safe habitat, they are more likely to encounter humans, and the associated increased risks of food habituation, mortality through mistaken identity, vehicle collisions, or control actions, or be increasingly exposed to encounters with adult bears, which can lead to direct intraspecific mortality or indirect stress-induced reduced vigor.

Some genetic interchange is essential to small populations if the risks of inbreeding is to be reduced. In grizzly bears, subadult males are the most likely to disperse large distances, but they also experience higher mortality than other sectors of the populations (Interagency Grizzly Bear

Committee 1987). Young bears of both sexes experience higher natural mortality rates than adults. For an animal that requires huge caloric intake to support winter denning, obtaining adequate food intake can be precarious when coupled with learning new habitat and trying to avoid predation and other threats. Subadults also are the age group most likely to be habituated and subject to control measures.

Survival and Recovery

Grizzly bears are resilient, intelligent and adaptable. If provided with adequate food and habitat and given protection from roads, disturbance and human-caused mortality, they can recover. The Kootenai, Lolo, and Panhandle have made and are continuing to make strides in reducing access to grizzly bear habitat and in providing bear security. On the negative side, the Rock Creek Project impacts are significant, long-term, continuous, and in many aspects, permanent. Coupled with other impacts in the ecosystem, these impacts are magnified. Loss of bears in terms of significant interference of breeding, feeding and sheltering on at least 30 percent of the Cabinet portion of the CYE is expected.

Grizzly bears have an extremely low reproductive rate, high caloric intake needs, strong tendency towards habituation when rewarded with food, and are feared or disliked by many people who live in the CYE area. Fragmentation of the habitat is a significant threat to the population. Roads, rivers, and human developments in the CYE already form a semi-permeable barrier between the Cabinet and Yaak portion of the ecosystem. The Rock Creek Project, especially when coupled with Montanore will further degrade the continuity of habitat. Situations in Canada currently allow some movement of bears between the CYE and the Selkirks, but this corridor is currently not protected, nor is the security of bears in Canada. The CYE is a small, heavily-roaded, multi-use ecosystem with existing impacts, including a pocket of human habituation in the center, that will continue to adversely impact individuals and the population as a whole whether or not the Rock Creek Project goes forward. Reproduction is extremely low in the population. Over 60 percent of the reproduction has resulted from one bear, recently killed by another bear. Human-related mortality is a significant threat to the CYE. The risks of mortality resulting from mistaken identity, defense of life and property, control actions and malicious killing are likely to increase with the influx of people and activity to the area.

The successful maturation of young to reproductive age is essential for grizzly bears to survive and persist. Female survival is the most sensitive critical element to recovery of the population (Recovery Plan). Extinction may be eminent for grizzly bears in the CYE if human-caused mortality results in a significant loss of reproductive females. Loss can be manifested through direct mortality of females, mortality of cubs, or the more indirect losses due to displacement where females fail to gain enough secure food to support successful reproduction and potential regeneration is lost.

The Service believes that one reason the small population of 30-40 grizzly bears in the CYE remains vulnerable to extinction is because only 4 females with young have been documented and 1 monitored female (No. 106) was responsible for 65 percent or 11 of 17 cubs documented in the CYE since 1986. Bear No. 106 was found dead in 1999 and was thought to have been killed and consumed by another grizzly.

Intra-specific predation also may be increased by stress or displacement, although cause and effect is difficult, if not impossible, to quantify. Intra-specific predation and cub mortality has been documented, but usually as anecdotal information–never in comparison to habitat security or food availability. Occurrences may be higher than documented because of the difficulty of finding uncollared animals that have been preyed upon by another bear.

The loss of genetic heterogeneity may be a significant long-term threat to the small grizzly bear population in the CYE. Lehmkuhl (1984) reported that inbreeding depression is the most important and immediate consequence of a reduced population size, driven by an increase in homozygosity. Early stages of inbreeding depression usually result in increased juvenile mortality, and other common indicators can include reduce viability and fertility (Falconer 1981, Wright 1977, and Lasley 1978). Inbreeding depression manifests itself more prominently in populations that endure a severe bottleneck and are prevented from re-establishing their former numbers at a natural rate (human-induced mortality and habitat limitations continue to be a threat to population growth and recovery). It also is likely that occasional genetic interchange between grizzly bears in Canada, which currently retain a much larger gene pool across a large expanse of Canada, and occasional bears in the United States may be essential to the prevention of inbreeding in the CYE. If totally isolated from other grizzly bear populations, the risk of population-threatening inbreeding would be significant in a population this small.

The capability of the habitat to support a self-sustaining and self-regulating population is a primary factor in the survival and recovery of the CYE grizzly bear population. If the habitat is suitable to support all the stages of an individual's life cycle including the maturity of young to breeding age, then individual mortality concerns are reduced. If the habitat is suitable to support the needs of enough individuals to support a viable population, concerns regarding a populations' demographic structure and genetic health diminish. The available undisturbed habitat in the CYE is limited in the best of conditions. Human development and activities can only be expected to increase as populations increase and humans develop technology to develop and access lands that were previously unfeasible. Increased human settlement brings further access requirements, greater traffic, more recreational use, more attractants, more fragmentation of usable habitat and significantly increases the risks of adverse encounters between bears and people.

<u>Summary of Effects in Terms of Impacts to Grizzly Bears</u>

The Kootenai proposes to grant unrestricted access to private land patented under the provisions of the 1872 Mining Law in BMUs 4, 5, and 6. Authorizing the Rock Creek Project results in not achieving portions of grizzly bear Recovery Plan objectives and may curtail continued survival and recovery of the grizzlies in the CYE. The Rock Creek Project and its associated actions will result in the Kootenai not meeting some of their standards and guidelines for managing for the survival and recovery of the grizzly bear as stipulated in their 1987 Forest Plan and addressed under the ITS. The Service concludes that the Rock Creek Project will result in further degradation of the existing environmental baseline to the extent that significant impairment of breeding feeding and sheltering of bears in BMU 4, 5, and 6 would occur. Additional significant impacts would result from the increased risk of mortality due to the increase in people in the area, and the continued fragmentation of the habitat leading to potential disruption of genetic interchange in this part of the CYE. The basis for this conclusion is summarized in the following.

<u>Displacement of Grizzly Bears</u>

Habitat Effectiveness--The existing habitat effectiveness is below the standard of 70 percent in BMUs 4 (62.5 percent), 5 (64.8 percent), and 6 (68.0 percent) and the Rock Creek Project will further decrease the habitat effectiveness in BMU 4 (62.3 percent), 5 (64.1 percent) and 6 (65.8 percent) during the 35+ year-life of the Rock Creek Project. This is a significant long-term reduction in secure bear habitat throughout the life of the project. Annual monitoring reports (Table 8) indicate that only 4 of the 17 Kootenai BMUs fail to meet habitat effectiveness standards of 70 percent as of 1999 and 2 of those are affected by the Rock Creek Project.

ORD/Displacement Areas--The ORD is not met in all BAAs affected, although ORD across BMUs is less than 0.75 miles per square mile. The ORD standards provide BAA displacement habitat with suitable ORD levels that will be free from major activities. Displacement BAAs have road densities less than 0.75 miles per square mile, but the BA states that some of the roads in these BAAs are in MS-3 habitat and are not counted in calculations. It is likely that the lower elevation habitat along rivers and flatter portions of the BAA that qualifies as spring habitat also is the portion of the unavailable roaded MS-3 habitat. If like habitat is not provided, further displacement may result or fewer bears can be maintained on the same habitat.

ITS—ORD--See above. The ITS does not require the Kootenai to meet OMRD standards. However, the ITS does explain that OMRD is the method that used by researchers to address the effects of roads on bears. Displacement from roads is a significant effect on bears when it keeps them from preferred habitat or otherwise available habitat to the extent it reduces reproduction, feeding or sheltering. The BA included OMRD calculations as part of the analysis and the Rock Creek Project will increase OMRD 0.9 percent in BMU 5. Depending on where the mitigation lands are located, there may be further changes, and potential improvements, in OMRD or TMRD once moving windows is recalculated. More than half of the BMUs have OMRDs within (below) the levels identified by Wakkinen and Kasworm (1997) (33 percent) as of the 1999 Annual Monitoring Report (Table 8). Six of 17 BMUs are at or below the TMRD level identified by Wakkinen and Kasworm (1997). Road densities in most BMUs have improved since the ITS (Table 8, year 1997).

ITS—TMRD--The Rock Creek Project exceeds the level of incidental take anticipated in the Service's July 27, 1995, ITS due to the projected net increase in TMRD in BMUs 5 and 6. The Rock Creek Project will increase TMRD an estimated 1.8 percent in BMU 5 and 0.5 percent in BMU 6 during the Rock Creek Project.

ITS—Core--Core will not decrease in any BMU as a result of the Rock Creek Project and therefore complies with the ITS. Following conservation measures already identified in the BA, but not including opportunities that arise from the acquisition of mitigation habitat, the net change in the cores of the three affected BMUs is an increase of 1.2 percent (all in BMU 4).

However, the estimated amount of core habitat in BMU 6 will drop to 49.9 percent during the Rock Creek Project due to other land actions (Montanore) and remain well below 55 percent core (Wakkinen and Kasworm1997) during the Rock Creek Project. Core could decrease if trail use to Rock Lake or St. Paul Lake goes to high use. The BMU 6 was assigned a Priority 1 status by the Selkirk/CYE Grizzly Bear Management Subcommittee access taskforce working group in December 1998, but the Kootenai has no plan proposed to achieve 55 percent core, and the BMU remains degraded. Bears may have to increase their home range size to meet needs of normal reproduction, feeding and sheltering, at considerable risk to their safety. Habitat mitigation (locations to be determined) and habitat enhancements (currently unidentified, but which could include road closures) have some potential to improve core. Cores in 11 of the 17 BMUs in the Kootenai have over 55 percent habitat security. Most BMUs that have more than 1 year's data have increased core percentage since the ITS, although improvements have occurred slowly (Table 8).

<u>Habituation/Food Conditioning--Increased Mortality Risks</u>

The Kootenai (SEIS page 4-112) states that "T [threatened] and E [endangered species] mitigations would be phased in over the start-up period and be in place by the start up of full operations. Grizzly bear mitigation may not prevent incidental taking, therefore all action alternatives may adversely affect the grizzly bear."

The influx of people and related sanitation situations are associated with the mine, but may occur on private lands that are beyond the jurisdiction of the Kootenai or Sterling. Education and law enforcement positions can be effective at reducing the risk of bear mortality, but only if they are full-time positions that are initiated prior to the construction phase of the mine and for a period of time afterwards, are specifically hired to deal with issues related to the Rock Creek Project impacts (and not providing funding to existing positions), and can deal with habituation or law-enforcement issues proactively. Mitigation activities such as cleaning road kills from roads, not salting or planting to clover, restricting mine employees to bus transportation and not allowing employees to carry weapons, among others, will be instrumental in reducing risk of mortality, but cannot totally mitigate increased risks.

<u>Habitat Loss/Fragmentation</u>

Primarily low elevation habitat is impacted by the Rock Creek Project. The amount of suitable spring habitat components in designated core areas in each BMU is reported, but not the amount of spring habitat lost through surface disturbance and displacement due to the Rock Creek Project. The Service is unable to determine the quality of spring habitat nor whether the amount is sufficient to meet the needs of grizzly bears in BMUs 4, 5, and 6. Displacement areas provide a greater amount of spring habitat to bears than the spring habitat that is impacted in the affected BAAs. The mitigation plan provides that these displacement areas will be kept free from major activities throughout the life of the mine.

Loss and displacement from important spring and fall habitats during periods of use by the bears will occur in some of the affected BMUs and BAAs and may significantly affect the normal feeding, breeding and sheltering of grizzly bears in those BMUs now or at some time during the 35+ year-life of the Rock Creek Project. The Service considers this displacement to be long-term if not permanent, since bears have not been documented to return to habitat that has been heavily disturbed for extended periods of time, and the mitigation plan does not attempt to restore native plants in natural diversity to the area during reclamation. Habitat enhancement has been identified on over 400 acres, but specific areas or enhancement methods have not yet been determined. Habitat enhancement has some potential of improving bear habitat if fruiting shrubs and/or spring habitat can be enhanced, possibly through fire, and security habitat around these key habitats can be assured through road closures or other access restrictions.

The mitigation plan attempts to replace this lost habitat by acquiring private land through purchase or conservation easement equal to that impacted by the footprint of mine facilities and the tailing pile, and other impacts as identified in the mitigation plan. The acquisition of private habitat does not increase habitat available to bears, since habitat on undeveloped private land is currently available to bears, but it would ensure that these private lands remain secure for bear habitat in the future. Without such mitigation, future development or other changes that would make these lands unavailable or unsuitable to bears is highly likely. Mitigation habitat for the footprint of the mine is required within the on-site area (within BMU 4, 5, or 6). The mitigation plan attempts to replace impacted habitat with private habitat that provides at least the same or better quality habitat, but until final purchases or conservation agreements have been completed, and depending upon the location, the replacement habitat may or may not be equivalent to that lost to the facility and tailings pile, nor will replacement habitat adequately address the fragmentation of the Ecosystem (see Fragmentation and Loss of Habitat).

Mitigation habitat has been proposed to replace lost habitat through fee acquisition and conservation easements. As proposed, conservation easements have a limited lifetime. Ownership of the conservation easements remain with the Rock Creek Project during the life of the mine, but the BA fails to adequately address how these lands would be managed to benefit bears and balance the loss of habitat. The purchase of property or easements for sanctuary could become a mortality sink if bears are displaced into such habitat and the use changes from bear-friendly to dangerous to bears. The Service believes that mine reclamation has not historically been shown to restore functional native habitat. Any habitat acquired to mitigate for mine activities that is not perpetually supportive of bears could constitute a significant mortality risk to bears following the Rock Creek Project.

Significant impairment of connectivity within the Cabinets is likely due to the combined impacts of the Rock Creek Project, Montanore, activities on other mineral claims and patents in the Cabinet portion of the CYE. (BA, Appendix 10). The SEIS (page 4-124) provides an analysis of the cumulative effects of these projects on fragmentation:

> "The Cabinet/Yaak grizzly recovery zone is very small (2,580 square miles). The east half of the Cabinet Mountains provides 35.5 percent of the recovery acres in the Cabinet/Yaak recovery zone (CYE). Fragmenting this portion of the CYE, by having two major mine activities the Rock Creek Project and Noranda Montanore) active at the same time would cut off about 22.2 percent of the recovery zone. This would leave a recovery area too small to support the desired recovery population (U.S. Fish and Wildlife Service1993, part 2, page 17–[Recovery Plan]). In addition, any grizzly bears with an established home range in the south half of the Cabinet Mountains would have difficult time surviving over an extended time period due to the small area of suitable habitat. At a minimum this habitat constriction would effect (sic) 5 (31 percent) of the 16 known grizzly bears in the CYE. Even with mitigations core habitat would be changed from 1998 levels (Table 4-25 from SEIS). The north to south movement corridor could be further constricted as there are two proposals to access two parcels on the east side of the Cabinet Mountains."

The large percent and placement of the MS-3 habitat near the center of the CYE contributes to the potential of long-term isolation of grizzly bears in the southern third of the CYE from bears in the northern portion and other ecosystems. Mitigation habitat proposes only to provide protection of existing private habitat, but does not replace habitat lost to bears within the ecosystem.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the Rock Creek Project are not considered in this section because they require separate consultation pursuant to section 7 of the Act (50 CFR 402.14 (b)(3) and (4)).

The cumulative effects of increased public recreational use of public lands and significant amounts of roads to and management of private corporate timberlands within the action area contributes to the overall impacts of the Rock Creek Project. Recreational use and timber harvest on private property is largely unregulated by the Kootenai but has significant impacts to bears which can exceed the impacts from Federal actions. The Service finds these identified cumulative effects add to the level of impact of the Rock Creek Project. Additional pressure on the CYE habitat will occur with additional people moving to the area to build homes and recreate, and the risk of development of some of the patented claim parcels in the sensitive area of BMU 4, 5, and 6.

CONCLUSION

After reviewing the current status of the grizzly bear, the environmental baseline for the action area, the effects of the proposed Rock Creek Project and the cumulative effects, it is the Service's biological opinion that approval of the Rock Creek Project on the Kootenai as proposed, is likely to jeopardize the continued existence of the grizzly bear in the CYE. No critical habitat has been designated for this species, therefore none will be destroyed or adversely modified.

As proposed, the Rock Creek Project has the potential to significantly affect survival of bears within BMUs 4, 5, 6; would significantly reduce recovery in a population that is warranted for endangered status but precluded by other listing activities. The CYE recovery zone is currently impacted by subdivisions, human recreational increases, multiple use forest management, private commercial timber production, high road densities, small recovery zone area. Bears displaced out of preferred habitat may be unable to reproduce successfully or raise cubs to reproduction age, specifically in BMUs 4, 5, 6 as a result of the Rock Creek Project. Mortality risks increase significantly with the direct and indirect affects of the mine and these risks can only be partially offset. Some direct mortality of bears can be anticipated at some time during the 35+ year-life of the mine as a result of increased numbers of people in the area, although the current Recovery Plan mortality goal for this population is zero. The Rock Creek Project threatens to further fragment a narrow 7-mile wide movement corridor between the northern portion of the ecosystem and the ecosystem to the southeast. Significant impacts to the distribution of grizzly bears in the southern Cabinets are anticipated from the Rock Creek Project that jeopardize the population as a whole.

The Rock Creek Project, including mitigation, fails to meet the following Forest Plan standards or associated assessment criterion established for grizzly bear protection and the following terms and conditions in the ITS included in the Service's biological opinion on the Forest Plan overall (U.S. Fish and Wildlife Service 1995):

Forest Plan Standards or Associated Assessment Criterion Not Achieved:

1. Habitat effectiveness--fail to meet standards before, during and after the action.

2. Opening size is not met.

Terms and Conditions not achieved:

1. TMRD increases (does not meet the ITS) in two of three BMUs.

The IGBC (1994, 1998) identified moving windows as the preferred method to measure road densities in bear habitats. The TMRD and OMRD are the recommended calculations of road densities using moving windows. The BA identifies an increase of OMRD in one of three BMUs. Core in BMU 6 remains below 55 percent for the life of the mine. Wakkinen and Kasworm (1997) found that core was 55 percent in BMUs that supported successful females in the CYE. Core does not decrease as a result of the Rock Creek Project, so it complies with the specific ITS requirement of no net loss. Core is not maintained at the level found to support successful females in the ecosystem (Wakkinen and Kasworm 1997).

In 1993, the CYE grizzly bear population was found warranted for endangered status, but precluded by other listing priorities (1993 finding). As described earlier in this biological opinion, the Service found that grizzly bears in the CYE ecosystem warranted endangered status. However, we also found that further processing of the petition and reclassification of the species was precluded by other listing activities. The 1999 finding displayed re-calculated population parameters and lambda for the CYE as part of the process of evaluating the Selkirk population. Biological information described in the 1993 and 1999 findings is utilized in this opinion since it is the best available information regarding bears in the CYE. The CYE population has experienced 2 high mortality-years since the more recent 1999 finding analyzed the population and recovery parameters for the CYE remain far below targets.

Population trend data for the CYE, including draft 2000 data not yet published, will include the deaths of three cubs from the ecosystem in 2000, and high mortality in 1999 that was not addressed in the 1998 Rock Creek BA. This biological opinion considered those updated population parameters. The high mortality in 1999 and 2000 contributed to the conclusion that the Rock Creek Project is likely to jeopardize the CYE population unless reasonable and prudent alternatives and habitat improvements are implemented. Recent preliminary draft analysis by Kasworm (Wayne Kasworm, pers. comm.) incorporates the high losses in 2000 which will likely reduce lambda from that analyzed in this biological opinion.

Recreational use in the action area may be significantly higher than predicted. The BA states recreational use will increase during the life of the Rock Creek Project, particularly on the Rock Creek trail in the center of the area between the Rock Creek Project and Montanore. People will be attracted to the area by jobs at the mine, publicity, or support facilities (gas, groceries) associated with the Rock Creek Project. The increase of people to the area will increase the recreational and hunting pressure in the CYE significantly more than would be expected in the absence of the Rock Creek Project. The CYE is already impacted by rural residential intrusions along the edges and in the middle of the ecosystem. The CYE is an area largely managed for multiple use by the USFS. Several private companies and corporations also operate in the ecosystem. Increased risks of mortality associated with the direct and indirect impacts of the Rock Creek Project cannot be offset completely with the Kootenai’s mitigation plan (BA).

Other projects threaten to fragment movement in the narrow recovery zone. Collectively with the Rock Creek Project, they severely impact survival and recovery. Other projects in the area include the Montanore mine, which is currently in the baseline. Montanore accesses an ore body adjacent to the Rock Creek Project ore body, but approaches it from the north (under the wilderness area) and has similar potential impacts regarding increased numbers of people, habitat loss due to direct surface disturbance and displacement of bears away from activity areas. Two small patented mining claims were recently granted a USFS right-of-way authorization. The biological opinion that addressed these claims was amended because the Kootenai was unable to entirely restrict access to private land under ANILCA. There are more than a dozen other patented mining claims in the corridor between the Rock Creek Project and Montanore mines and the USFS has limited jurisdiction to reduce impacts that could occur on these private properties. Large scale mineral development is unlikely on these small patents (John McKay, Kootenai Geologist, pers. comm. 2000) due to the size of the patents and the nature of the mineral deposits. Potential activities on these private properties that could threaten bears include clear cutting, building structures, establishing hunting camps, maintaining livestock compounds with food and attractants, etc. Road access is not currently authorized to all patent owners, but the Kootenai may not have the authority to completely refuse access to private land if it is requested under current regulations.

These activities potentially could disturb the north-south movement corridor, described in the BA, constricting the secure habitat for bears to less than 2 miles wide in BMUs 4, 5, and 6. Much of the affected area is scree habitat (exposed rock) and steep topography, which may further force bears into contact with people in insecure habitat with related mortality risks, could increase adverse intra-species conflicts with other bears, or will displace them from essential habitat to the extent that significant impacts to reproduction and survival could result. Habitat acquisition to offset the impacts is not guaranteed to occur within this constricted area, and road closures cannot be guaranteed under regulations providing access to private property (ANILCA). There also are dozens of other mining claims (unpatented) that have occasional activity that potentially impact bears.

Even if other patents are not developed during the active life of the mine, the potential of activities at Montanore, the Rock Creek Project, and other established uses in BMUs 4, 5, and 6 coupled with the increased recreational and hunting use is likely to severely fragment the ecosystem and jeopardize the population.

REASONABLE AND PRUDENT ALTERNATIVE

Regulations (50 CFR §402.02) implementing section 7 of the Act define reasonable and prudent alternatives (RPA) as alternative actions, identified during formal consultation that--(1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented in a manner consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

The following four-part RPA has been developed for the Rock Creek Project. The RPA must be implemented in full to avoid jeopardy, and the Kootenai must provide assurance that the RPA and terms and conditions under the incidental take statement of this document will be followed for the entire life of the Rock Creek Project, or longer, in the case of perpetual conservation easements.

Part A of the RPA requires the Kootenai to develop a management plan and a process to implement that management plan which incorporates the Kootenai's proposed mitigation plan and incorporates other details the Service requires to avoid jeopardy. Part B of the RPA addresses specifics the Service requires of the Kootenai regarding the information and education and law enforcement positions to reduce mortality risks. Part C of the RPA requires the Kootenai to implement access management to improve habitat security after mitigation properties are acquired and/or if trail use exceeds the level the Service considers acceptable for the grizzly bear. Part D requires the monitoring of grizzly bear movements within the southern portion of the CYE affected by the Rock Creek Project.

RPA Part A--Management Plan to Avoid Jeopardy

The Kootenai shall develop a Memorandum Of Understanding (MOU) with the Service, Montana Fish Wildlife and Parks, Sterling Mining Company and other parties deemed appropriate by the Kootenai that must be completed prior to the Kootenai issuing to Sterling the letter to proceed with the evaluation adit. The MOU shall establish roles, responsibilities and time lines for a comprehensive grizzly bear management plan (hereafter referred to as the management plan) and its implementation subject to Service concurrence. The management plan shall focus on BMUs 4, 5, 6 and the Cabinet portion of the CYE, would fully encompass the Kootenai's revised mitigation plan for threatened and endangered species (Appendix C); would be developed in detail by the parties and approved in writing by the Service to assure that access, habitat quality and fragmentation issues that jeopardize the population shall be addressed to the extent that jeopardy will be avoided.

The specifics addressed under 1 (below) address issues related to the entire Rock Creek Project. Requirements 2 and 3 are tiered specifically to phases of the mine. Requirements related to the **evaluation adit phase** of the mine are listed under 2 and 3 and address requirements related to the **construction, production and reclamation phases** of the mine.

1. The following management plan requirements apply to the **entire Rock Creek Project**:

   The Kootenai shall develop the MOU prior to the Kootenai issuing to Sterling the letter to proceed with the evaluation adit. The following must be included in the MOU and resultant management plan in order to avoid jeopardy. In the development of the MOU and resultant management plan, additional specifics may be developed by the parties and will be included if approved by the Service:

a. Management Plan--The Kootenai shall ensure that a management plan to avoid jeopardy of grizzly bears will be developed and implemented as described herein that addresses the mitigation acres, access management, sanitation, monitoring and other issues related to grizzly bears in BMUs 4, 5, 6 that are associated with this Rock Creek Project. Implementation of the management plan will ensure that fragmentation and mortality risks associated with this Rock Creek Project will be reduced to avoid jeopardy. The plan and any implementation of the plan would need to be approved by the Service in the manner agreed to in the MOU under roles and responsibilities.

b. Time Lines--The management plan can be completed in stages, on a time line agreed to by the Service in the MOU, but the Kootenai shall ensure that the implementation process will be initiated prior to issuing the letter to proceed on each phase of the mine as specified in the mitigation plan, except where implementation must be completed prior to the Kootenai issuing to Sterling the letter to proceed, as explained herein.

c. Amount and Location of Mitigation Habitat--The Kootenai shall ensure that under the Kootenai's mitigation plan in the BA, 2,350 acres plus the 100 acres to offset impacts to the north-south habitat corridor (BA) are acquired. Except where more specifically located (in the north-south habitat corridor), these properties shall be located within the grizzly bear recovery zone in BMUs 4, 5, 6. The BMUs 7 or 8 can be considered for some mitigation acres only if benefits to grizzly bears affected by the Rock Creek Project are superior to other options and are approved by the Service.

d. Require No Loss of Recovery Habitat--The Kootenai shall ensure that no reduction of Federal land supportive of grizzly bear recovery in the CYE Recovery Zone (after any gains resulting from mitigation) occurs as a result of any mitigation, land acquisitions or exchanges related to this Rock Creek Project. All lands acquired as fee-title or conservation easement shall be managed for grizzly bear security in perpetuity while held in private ownership. Because mitigation properties are prioritized to address lands that best ameliorate the fragmentation and habitat quality issues, acquisition efforts (whether by fee-title or conservation easement) will address properties in priority order and offer rationale of the selection of lower priority properties over higher priority properties.

e. Land Exchanges of Mitigation Habitat--Land exchanges of mitigation property would not allow losses or declines of secure grizzly bear habitat in BMUs 4, 5, or 6. Trades would be allowed, subject to Service approval, if the exchange offers benefits to grizzly bears affected by the Rock Creek project, for example if the USFS chooses to exchange Federal lands under the tailings pile for secure grizzly habitat.

f. Requirements of Fee-title Land Acquired as Mitigation Habitat--The Kootenai shall ensure that any fee title lands acquired by Sterling for mitigation are conveyed to the USFS as specified in the mitigation plan; fee-title properties acquired for mitigation, held at any time by Sterling or other private entity, shall require that legal constraints (likely to be an easement or restrictive covenant); be attached to the title of these properties to ensure that while these properties are in private ownership they will have no human-related food attractants and will provide secure grizzly bear habitat for perpetuity; shall cover all surface and mineral rights; and shall be executed and recorded immediately so that this protection will remain attached to the title in the event of any change in ownership prior to transfer (via donation or exchange) to the USFS. In the event that transfer to the USFS does not occur directly, the conservation easement or restrictive covenant will be held by the USFS until fee-title of property can be conveyed to the USFS;

g. Management of Mitigation Lands Transferred to the Kootenai--Once lands or interest in lands are conveyed to the USFS, the Kootenai shall manage these lands in land allocations supportive of grizzly bear recovery.

h. Requirements of Conservation Easements Acquired as Mitigation Habitat--The Service shall be provided the opportunity to review and oppose easements or restrictive covenants prior to recording. Any conservation easement language or restrictive covenant used for mitigation easements must be approved by the Service, must cover all surface and mineral rights, must ensure that no human-related food attractants would occur on these properties and the land would be managed for secure grizzly habitat for perpetuity while in private ownership and be attached to the title to ensure that the protective easement would follow the property in the event of private owner transfer. In the event it is acquired by the USFS, that it be managed in allocations supportive of grizzly bear. Conservation easements or restrictive covenants must be executed and recorded immediately. The USFS will hold and enforce all conservation easements associated with either conservation easements or fee title (under f above) unless or until the full-title land deed with all rights is transferred to the USFS. In the event that Sterling directly acquires any conservation easement, they shall immediately transfer any conservation easement they hold at any time related to these mitigation properties to the USFS.

i. Lands or Interest in Lands held by the U.S. Forest Service--Lands or interest in lands held by the USFS must include the surface and mineral estates. All land interest conveyed must be acceptable to the USFS and approved by the Office of General Counsel. Conservation easements and restrictive covenants must be prepared and conveyed in accordance with Department of Justice standards. Fee title property must be conveyed by Warranty Deed to the USFS in accordance with Department of Justice standards. Fee title of property accepted by the USFS must be clean of hazardous substances in accordance with Federal laws. The USFS and Service shall be consulted in the preparation of conveyance documents and restrictive covenants.

j. Control of Trail Impacts--The Kootenai shall develop a process to remedy core and mortality risk issues in the event that monitoring of the Rock Creek or St. Paul trails indicate use is approaching high use as defined by IGBC 1998, or the level that any future research shows will displace bears to a level unacceptable by the Service. The

Kootenai shall incorporate the process into the management plan within 3 years of the issuing of the ROD and ensure that corrective actions, as approved by the Service, are implemented immediately if that use level is reached.

2. The Kootenai shall ensure that the following requirements related to the **evaluation adit phase** are met prior to the issuance of the letter to proceed:

   a. The Kootenai shall ensure that the mitigation acres for the evaluation adit must satisfy all of the following:

      i. Evaluation mitigation adit properties are transferred to the USFS as fee title lands; and

      ii. include all surface and mineral rights; and

      iii. have language guaranteeing that the lands are managed, during private ownership, as attractant-free and secure grizzly bear habitat for perpetuity and such language is attached to the title and is executed and recorded until the land is transferred to the USFS when it shall be managed under allocations supportive of grizzly bear recovery; and

      iv. title transfer to the USFS shall take place prior to the Kootenai issuing the letter to proceed with the development of the evaluation adit; and

      v. be located in the north-south movement corridor; and

      vi. be approved in advance by the Service to avoid jeopardy.

   b. The Kootenai shall ensure that the grizzly bear management specialist and warden positions (described under RPA B) are filled and in place prior to the Kootenai issuing to Sterling the letter to proceed with the evaluation adit.

3. The Kootenai shall ensure the following requirements associated with the **construction, production and reclamation phases** are met:

   a. <u>Mitigation Acres</u>--The Kootenai shall ensure that the remaining 2,350 mitigation acres plus the balance of the 100 acres that have not been acquired during the earlier phase of the mine are identified and the Service shall approve these properties and conservation language, as appropriate, prior to acquisition as fee title or conservation easement. The Kootenai shall ensure that any human-food attractant problems on acquired properties are remedied immediately after acquisition.

b. Location--The balance of the 100 acres are located within the north-south movement corridor (BA). The 53 acres previously acquired for the evaluation adit mitigation may be counted towards this 100 acres that must be specifically located in the north-south movement corridor, but does not reduce the total acres required across BMUs 4, 5, or 6 for Kootenai's mitigation plan.

The other 2,350 acres, not already acquired, are located in BMUs 4, 5, or 6 of the CYE grizzly bear recovery zone. Some can be located in BMUs 7 and 8 only if benefits to grizzly bears affected by the Rock Creek Project is superior to other options and is approved by the Service.

c. Time Lines--The Kootenai shall ensure that the fee title transfer or conservation easement of 1,774 acres for mine mitigation and the remaining 100 acres for the north south corridor are acquired prior to the bear emergence date the year the Kootenai issues a letter to proceed on the construction phase of the mine. This will ensure secure habitat is in place and sanitation concerns are addressed before the influx of people associated with the construction and production phase of the mine. The remaining 566 acres associated with road reconstruction are acquired prior to the initiation of operations and the final 10 acres associated with the wilderness ventilation adit are acquired prior to any construction on that adit in the event it is needed, unless already acquired under earlier phases of the mine.

RPA Part B--Law Enforcement and I & E Positions

The Kootenai shall ensure that:

1. the proposed full-time staff position related to Information and Education shall be a grizzly bear management specialist (or its equivalent) and the full-time staff position related to enforcement shall be a warden (or its equivalent) with Montana Department of Fish, Wildlife, and Parks; and

2. these positions are fully-funded including salary and benefits, vehicles, overhead, supplies, and cost of living for the life of the mine and throughout the reclamation period; and

3. those positions are additional new positions in Montana Fish Wildlife and Parks to deal with bear issues related to the Rock Creek Project; that monies for these positions is not used to fund existing positions or activities unrelated to the Rock Creek Project or grizzly bears. These positions are designed to be shared with Montanore should that mine go operational; and if Montanore does not go operational, will be fully funded by Sterling

4. at least the warden position is located in the Clark Fork Valley.

Timing--The Kootenai shall ensure that the people filling these positions will be hired and operating prior to the Kootenai issuing a letter to proceed with the evaluation adit.

RPA Part C--Access Management

The Kootenai shall incorporate access management into the management plan, to address opportunities to improve bear habitat associated with acquired mitigation properties, within 1 year of the acquisition (by any party) of mitigation properties through fee title or conservation easement. The Service shall approve the access plan prior to implementation. The implementation process shall be initiated prior to issuing the letter to proceed on the next phase of the mine as specified in the management plan and/or MOU.

1. Trail Use--The Kootenai shall ensure that use levels on the Rock Creek Project and St. Paul Lake trails are monitored by a method acceptable to the Service. The Kootenai shall implement trail management or other actions immediately to reduce impacts to bear security if use levels reaches high use.

2. Access Management on Acquired Lands--Once the mitigation acres have been identified and acquired, additional opportunities will be available to secure grizzly bear habitat through access management. The Kootenai shall ensure that access management is incorporated into the management plan within 1 year of acquisition to improve OMRD, TMRD, Core, and habitat effectiveness. The process of implementation shall be initiated prior to the appropriate phase as specified in the management plan.

RPA Part D--Monitoring

The Kootenai shall secure adequate funding to monitor grizzly bear movements within the Cabinet portion of the CYE to ensure the management plan is adequate to avoid jeopardy. The monitoring shall be part of the Service's ongoing grizzly bear research in the CYE and shall be conducted or coordinated by the Service's grizzly bear researcher in Libby or his equivalent.

1. Bear use shall be monitored within the southern portion of the CYE to verify the beliefs of this biological opinion and evaluate the effectiveness of the management plan at avoiding jeopardy. Monitoring efforts shall be initiated prior to the Kootenai issuing to Sterling the letter to proceed with the evaluation adit, and will continue for the life of the mine (including the reclamation phase).

Because this biological opinion has found jeopardy, the Kootenai is required to notify the Service of its final decision on the implementation of the reasonable and prudent alternatives and report annually as to the progress of the Rock Creek Project and mitigation.

INCIDENTAL TAKE STATEMENT

The Service has developed the following incidental take statement based on the premise that the RPA included in this opinion will be implemented.

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, respectively without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is further defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Kootenai so that they become binding conditions of any grant or permit issued to Sterling, as appropriate, for the exemption in section 7(o)(2) to apply. The Kootenai has a continuing duty to regulate the activity covered by this incidental take statement. If the Kootenai 1) fails to assume and implement the terms and conditions or 2) fails to require that Sterling adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Kootenai must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement {50 CFR § 402.14 (i)(3)}.

Amount or Extent of Take Anticipated

The BA identifies increases in OMRD and TMRD as a result of the proposed action. High road densities increase the risk of take of bears (U.S. Fish and Wildlife Service 1995) by habituating some bears and displacing some bears, both activities that adversely affect normal behavior patterns. The increase in TMRD as a result of the proposed action constitutes a violation of the terms and conditions in the Service's incidental take statement in the biological opinion on the Forest Plan (U.S. Fish and Wildlife Service 1995). The 1995 ITS provided levels of authorized take due to road densities that would be allowed and not jeopardize grizzly bears in the CYE. This Rock Creek Project would exceed the TMRD standard and exceed the existing authorized take.

The Service believes that incidental take of grizzly bears is occurring in the existing (pre-project) environmental baseline of BMUs 5 and 6, as previously described in the Service's 1995 ITS on the Forest Plan (U.S. Fish and Wildlife Service 1995) and the Way-up and Fourth of July Biological Opinion (U.S. Fish and Wildlife Service 1998) due to high open road densities in BAAs 5-6-6, 5-6-7, 5-5-6, and 5-5-5. Roads and other disturbances and significant increases in human use of trails and foot-traffic on closed roads associated with the Rock Creek Project would further erode TMRD and OMRD. Based upon the scientific information available on the effects of roads on grizzly bears, it is the biological judgement of the Service that, coupled with the existing OMRD, TMRD and core, the Rock Creek Project will result in significant habitat modification or degradation which results in actual injury to grizzly bears by significantly impairing normal behavioral patterns, including breeding, feeding or sheltering. Loss is anticipated due to displacing bears from necessary habitat within their home range such that survival and reproduction may be significantly reduced.

The Service anticipates incidental take of grizzly bears resulting from the displacement from mine activities and road and trail use associated directly or indirectly with the Rock Creek Project will be difficult to detect and is largely unquantifiable. Grizzly bear mortality or reduced reproduction resulting from displacement from habitat usually cannot be documented. The Service is unaware of scientific or commercial information that could be used to quantify the exact level of incidental take as a result of the road and trail use. The best scientific data now available are not sufficient to enable the Service to quantify a specific amount of incidental take of the species itself. Therefore, the anticipated level of incidental take of grizzly bears as a result of increased road and trail access and use, and associated mining operations in BMUs 4, 5, 6, in terms of numbers of bears, is numerically ‘unquantifiable’. In such cases, the Service uses surrogate parameters to measure the impact of the take on the species and provide the threshold for reinitiation of consultation. In this particular case, the Service will use the surrogate measures of OMRD, TMRD, and core to measure the impact of roads and trails on grizzly bears and provide the threshold for requiring reinitiation of consultation.

Incidental take of grizzlies also is anticipated from activities that will result in habituation and food conditioning of certain bears within the population, increasing their vulnerability to illegal shooting, defense of life or control actions. Increased risk of habituation and food conditioning of bears is associated with the influx of workers and their families to the area, significant increases in non-motorized trail use on the Rock Creek Trail and other trails in the area, and improved access to the area, leading to increased levels of food, garbage and other human-related attractants. The Service believes that the impacts of the Rock Creek Project will permanently change the human population numbers, and resultant impacts to bears, in the Clark Fork Valley beyond the increases that would occur under a non-mining scenario. The grizzly bear specialist and law enforcement positions required in the RPA will reduce the risk of habituation and food conditioning of bears, as well as the potential for illegal shooting of bears.

The Service anticipates one grizzly bear will be incidentally taken as a result of food rewards associated with the proposed action. Specifically, if one incident arises involving food rewards such that the management actions of hazing, trapping or control actions are initiated, this would constitute the take of one grizzly bear. The changes in the behavioral patterns of one bear that results from a food reward constitutes the take that is allowed in this situation. The control action, which is a direct take authorized under 50 CFR 17.40, is a measure to determine if a food reward-related take has occurred.

This take of one grizzly bear also will trigger the re-evaluation of the situation by the Service to determine if additional measures should be implemented to reduce future interactions. In addition, should the monitoring of the sanitation issues report indicate that black bears are gaining food rewards, additional evaluation should be initiated. Black bear activity often precedes similar activity by grizzly bears and can predict where there may be situations that require closer hygiene prior to take of grizzly bears. Additional situations in the action area of grizzly bears receiving food rewards, as demonstrated by the involvement of the grizzly bear management specialist or warden, would constitute an unpermitted take of a second bear, even if it is the repeated take of the first bear. The second incident would not be authorized under this Incidental Take Statement and would lead to the reinitiation of formal consultation.

<u>Effect of the Take</u>

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species when the RPA is implemented.

REASONABLE AND PRUDENT MEASURES

This biological opinion includes reasonable and prudent measures (RPM) to minimize incidental take. These measures, which are described below, are nondiscretionary and must be implemented by the Kootenai in order for the exemption in §7(o)(2) to apply. The Kootenai has a continuing duty to regulate the activities that are covered by this incidental take statement. If the agency fails to adhere to the terms and conditions of the incidental take statement, the protective coverage of §7(o)(2) may lapse. Should the amount or extent of incidental taking be exceeded, or any of the mitigation and conservation efforts be modified, the Kootenai must reinitiate communication with the Service immediately to determine if reconsultation is required or other discussions are adequate to address those changes.

The Rock Creek Project as described and analyzed in this biological opinion will result in increased OMRD and TMRD as described under effects, and core remains low in BMU 6. The impacts of such a long term continuation of degraded environmental conditions coupled with the long-term displacement of year-around, 24-hour activities, and the increased mortality risks associated with this Rock Creek Project are considered to be significant without proactive measures to reduce this risk.

The Service believes the following RPMs are necessary and appropriate to minimize impacts of incidental take of grizzly bears:

1. Reduce the potential take of grizzly bears resulting from displacement by reducing roads and trails as defined in the management plan developed under the RPA.

2. Reduce the take from habituation and food/conditioning.

<u>Terms and Conditions</u>

In order to be exempt from the prohibitions of section 9 of the Act, the Kootenai must, in addition to implementing the mitigation plan as proposed, comply with the following terms and conditions which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. In order to meet the RPM 1 implement the following terms and conditions:

    a. Monitor use of Rock Creek and St. Paul Trails and implement actions immediately to reduce impacts to habitat security if monitoring indicates high use

    b. The Kootenai shall ensure that access management will be incorporated into the management plan within 1 year of acquisition of mitigation acres to improve OMRD, TMRD, Core, and habitat effectiveness. The process of implementation shall be initiated prior to the appropriate phase as specified in the management plan.

    c. Identified displacement areas (BAAs) as defined in the Kootenai's mitigation plan shall remain undisturbed for the life of the mine. If through the management planning process under the RPA, additional protection for bears is required, the Kootenai shall work with the Service to ensure adequate habitat security for grizzly bears in BMUs 4, 5, and 6 throughout the life of the mine.

    d. Monitor the RPA management plan progress and effectiveness and adjust as necessary to meet the RPA

2. In order to meet the RPM 2 implement the following terms and conditions:

    a. The Kootenai shall implement a food storage order in BMUs 4, 5, 6 prior to the letter to proceed for the evaluation adit. The food storage order shall continue throughout the life of the mine.

    b. Monitor grizzly bear and black bear sanitation incidents in BMUs 4, 5 ,6 and correct sanitation issues through enforcement of the food storage order and/or through education property protection activities conducted by the grizzly bear management specialist as necessary to comply with the RPA and RPM.

CONSERVATION RECOMMENDATIONS

Use the list of native species in Tables G-4 through G-6 of the EIS Revegetation Plan, Appendix G and ensure that a full mix of native species is planted and established following reclamation. Avoid the use of aggressive non-native grasses such as orchardgrass, foxtail and mountain brome in any reclamation mix. Require re-seeding of natives in the likely event of failure. Ensure that native shrubs and forbs, particularly fruit and nut-bearing shrubs, are cultivated from on-site sources and cultivated in the vicinity, so that seed or live plants can be acclimated and used for transplant on the reclamation lands. Plant such established individual shrubs at regular intervals throughout the reclamation lands similar to the density and clumpiness found on undisturbed habitat in the CYE. Incorporate weed controls on these lands for whatever time is necessary to stop weed invasion before native vegetation is assured. Do not authorize release from the reclamation phase of the mine until a suitable mix and distribution of native shrubs, trees, forbs, and grasses has been established and is self-perpetuating.

Ensure that the optional organic matter and fertilizer addressed in the EIS is required to be incorporated into all topsoil storage piles at the time it is initially removed so that when the soil is to be re-applied to reclamation sites, the soil biota and organic matter would be more thoroughly incorporated. Additional organic matter may be added at the time the topsoil is placed on the reclamation site.

Require that wetland mitigation acres also include enhancements to ensure the natural functioning of these important systems will occur following mitigation. Consider a mitigation ratio of at least 2:1 or 3:1.

Monitor flow rates on springs above the mine and attempt to map hydrologic flow and function that is affected by the water yield from the mine. Should such monitoring indicate that the mine has an impact on surface hydrology, implement mitigation to compensate.

PART B - BULL TROUT

STATUS OF THE SPECIES

A. Species/Critical Habitat Description

Description

For years, the bull trout and Dolly Varden (*Salvelinus malma* Girard) were combined under one name, the Dolly Varden (*Salvelinus malma* Walbaum). In 1980, with the support of the American Fisheries Society, they were recognized as two distinct species. Two of the most useful characteristics in separating the two species are the shape and size of the head (Cavender 1978). The head of a bull trout is more broad and flat on top, being hard to the touch, unlike Dolly Varden. Bull trout have an elongated body, somewhat rounded and slightly compressed laterally, and covered with cycloid scales numbering 190-240 along the lateral line. The mouth is large with the maxilla extending beyond the eye and with well developed teeth on both jaws and head of the vomer (none on the shaft). Bull trout have 11 dorsal fin rays, 9 anal fin rays, and the caudal fin is slightly forked. Although they are often olive green to brown with paler sides, color is variable with locality and habitat. Their spotting pattern is easily recognizable showing pale yellow spots on the back, and pale yellow and orange or red spots on the sides. Bull trout fins are tinged with yellow or orange, while the pelvic, pectoral, and anal fins have white margins. Bull trout have no black or dark markings on the fins.

Habitat Requirements

Bull trout are sensitive to environmental disturbance at all life stages, and have very specific habitat requirements. Bull trout growth, survival, and long-term population persistence appear to be dependent upon five habitat characteristics: temperature, substrate composition, migratory corridors, channel stability and cover (Rieman and McIntyre 1993). Cover includes undercut banks, large woody debris, boulders, and pools which are used as rearing, foraging and resting habitat, and protection from predators (U.S. Department of the Interior 1997b). Deep pools also help minimize and moderate stream temperatures and offer refuge from warmer water temperatures during summer low-flow conditions. Stream temperatures and substrate types are especially important to bull trout.

Temperature

Cold water temperatures are required for successful bull trout spawning and development of embryos and juveniles; cold water temperature also influences the distribution of juveniles (Bjornn and Reiser 1991; Goetz 1989; McPhail and Murray 1979; Pratt 1992; Fraley and Shepard 1989). Bull trout are associated with the coldest stream reaches within basins and spawning typically occurs in areas influenced by groundwater (Allan 1980; Shepard et al. 1984; Ratliff 1992; Fraley and Shepard 1989). In a recent investigation in the Swan River drainage (Montana), bull trout spawning site selection occurred primarily in stream reaches directly influenced by groundwater upwellings or directly downstream of these upwelling reaches (Baxter et al 1999). In addition, warmer summer stream temperatures, as well as extreme winter cold temperatures that can result in anchor ice, may be moderated by cold water upwellings. In one study by Goetz (1994) juvenile bull trout were not found in water temperatures above 12° C. Many studies show that temperatures must drop below 9 or 10 °C before spawning occurs (McPhail and Murray 1979; Riehle 1993). Egg survival decreases as water temperature increases, with higher survival levels documented at 2-4 °C (McPhail and Murray 1979). The best bull trout habitat in several Oregon streams has temperatures which seldom exceed 15 °C (Buckman et al. 1992; Ratliff 1992; Ziller 1992).

Fine Sediment (Substrate Composition)

Preferred spawning habitat includes low gradient streams with loose, clean gravels (Fraley and Shepard 1989). Fine sediments fill spaces between the gravel that are needed by incubating eggs and fry. Because bull trout eggs incubate about 7 months in the gravel they are especially vulnerable to fine sediments and water quality degradation (Fraley and Shepard 1989). Juveniles are similarly affected, as they also live on or within the stream bed cobble (Oliver 1979; Pratt 1984).

Bull trout are more strongly tied to the stream bottom and substrate than other salmonids (Pratt 1992). Substrate composition has repeatedly been correlated with the occurrence and abundance of juvenile bull trout (Rieman and McIntyre 1993) and spawning site selection by adults (Graham et al. 1981; McPhail and Murray 1979). Fine sediments can influence incubation survival and emergence success (Weaver and White 1985) but also may limit access to substrate interstices that are important cover during rearing and overwintering (Goetz 1994; Jakober 1995).

Migratory Corridors

Migratory bull trout ensure interchange of genetic material between populations, thereby promoting genetic variability. Unfortunately, migratory bull trout have been restricted or eliminated due to stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. Migratory corridors tie seasonal habitat together for anadromous, adfluvial, and fluvial forms, and allow for dispersal of resident forms for recolonization of recovering habitats (Rieman and McIntyre 1993). Dam and reservoir construction and operation have altered major portions of bull trout habitat throughout the Columbia River Basin. Dams without fish passage create barriers to fluvial and adfluvial bull trout which isolates populations, and dams and reservoirs alter the natural hydrograph, thereby affecting forage, water temperature, and water quality (USDI 1997b).

Channel Stability and Stream Flow

Bull trout are exceptionally sensitive to activities that directly or indirectly affect stream channel integrity. Juvenile and adult bull trout frequently inhabit areas of reduced water velocity, such as side channels, stream margins, and pools. These areas can be eliminated or degraded by management activities (Rieman and McIntyre 1993). Bull trout also are sensitive to activities that alter stream flow. Incubation to emergence may take up to 200 days during winter and early spring. The fall spawning period and strong association of juvenile fish with stream channel substrates make bull trout vulnerable to flow pattern changes and associated channel instability (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993; Rieman and McIntyre 1993).

Patterns of stream flow and the frequency of extreme flow events that influence substrates are anticipated to be important factors in population dynamics (Rieman and McIntyre 1993). With overwinter incubation and a close tie to the substrate, embryos and juveniles may be particularly vulnerable to flooding and channel scour associated with the rain-on-snow events common in some parts of the range (Rieman and McIntyre 1993). Channel dewatering tied to low flows and bed aggradation also has blocked access for spawning fish resulting in year class failures (Weaver 1992).

Surface/groundwater interaction zones, which are typically selected by bull trout for redd construction, are increasingly recognized as having high dissolved oxygen; constant cold water temperatures; and increased macro-invertebrate production (R. Edwards, University of Washington, pers. comm. 1998).

B. Life History

Life History Characteristics

Two distinct life-history forms, migratory and resident, occur throughout the range of bull trout (Pratt 1992; Rieman and McIntyre 1993). Migratory forms rear in natal tributaries before moving to larger rivers (fluvial form), lakes (adfluvial form), or the ocean (anadromous) to mature. Migratory bull trout may use a wide range of habitats ranging from 1st to 6th order streams and varying by season and life stage.

Most bull trout spawning occurs between late August and early November (McPhail and Murray 1979; Pratt 1992). Hatching occurs in winter or early spring, and alevins may stay in the gravel for extended periods. Growth is variable with different environments, but first spawning is often noted after age 4, and the fish may live 10 or more years (Mc Phail and Murray 1979; Pratt 1992, Rieman and McIntyre 1993). Although spawning typically occurs in 2nd to 5th order streams, juveniles may move upstream of reaches used by adults for spawning, presumably to forage in other accessible waters (Fraley and Shepard 1989; Ratliff 1992). Recent bull trout observations indicate that juveniles migrate from spawning streams to rearing (non-spawning) tributaries to enhance growth and survival (E. Reiland, D. Schmetterling, pers.comm.). Seasonal movements by adult bull trout may range up to 300 kilometers (km) as migratory fish move from spawning and rearing areas into overwinter habitat in the downstream reaches of large basins (Bjornn and Mallet 1964; Fraley and Shepard 1989). Telemetry data continues to document large movements by migratory bull trout.

C. Status and Distribution

Listing

The Service published the proposed rule on June 13, 1997 (USDI 1997a). On June 10, 1998, the Service published the final rule listing the Klamath River and Columbia River DPSs as threatened (USDI 1998a), with an effective date of July 10, 1998. On November 1, 1999 the Service published a rule listing all populations of bull trout as threatened (USDI 1999) throughout its entire range in the coterminous United States. That listing added the St. Mary/ Belly River and Puget Sound populations along with the Columbia River population as the listed stocks.

Historic and Current Distribution (Rangewide)

The historic range of bull trout was restricted to North America (Cavender 1978; Haas and McPhail 1991). Bull trout have been recorded from the McCloud River in northern California, the Klamath River basin in Oregon and throughout much of interior Oregon, Washington, Idaho, western Montana, and British Columbia, and extending into Hudson Bay and the St. Mary's River in Saskatchewan.

Bull trout are believed to be a glacial relict (McPhail and Lindsey 1986), and their broad distribution has probably contracted and expanded periodically with natural climate change (Williams et al. 1997). Genetic variation suggests an extended and evolutionarily important isolation between populations in the Klamath and Malheur Basins and those in the Columbia River basin (Leary et al.1993). Populations within the Columbia River basin are more closely allied and are thought to have expanded from common glacial refugia or to have maintained higher levels of gene flow among populations in recent geologic time (Williams et al. 1997). Bull trout are now extinct in California and only remnant populations are found in much of Oregon (Ratliff and Howell 1992). A small population still exists in the headwaters of the Jarbidge River, Nevada, which represents the present southern limit of the species' range. It is unlikely that bull trout occupied all of the accessible streams at any one time. Distribution of existing populations is often patchy even where numbers are still strong and habitat is in good condition (Rieman and McIntyre 1993,1995). Habitat preferences or selection is likely important (Dambacher and Jones 1997; Goetz 1994; Rieman and McIntyre 1995), but more stochastic extirpation and colonization processes may influence distribution even within suitable habitats (Rieman and McIntyre 1995).

Even though bull trout may move throughout entire river basins seasonally, spawning and juvenile rearing appear to be limited to the coldest streams or stream reaches. The lower limits of habitat used by bull trout are strongly associated with gradients in elevation, longitude, and latitude, that likely approximate a gradient in climate across the Basin (Goetz 1994). The patterns indicate that spatial and temporal variation in climate may strongly influence habitat available to bull trout (see Meisner 1990 for an example with another char). While temperatures are probably suitable throughout much of the northern portion of the range, predicted spawning and rearing habitat are restricted to increasingly isolated high elevation or headwater "islands" toward the south (Goetz 1994; Rieman and McIntyre 1995).

Status (Columbia River Distinct Population Segment)

The Service recognizes 141 subpopulations in the Columbia River DPS within Idaho, Montana, Oregon, and Washington with additional subpopulations in British Columbia. Bull trout in this Distinct Population Segment (DPS) are threatened by habitat loss and degradation, passage restrictions at dams, and competition from non-native brook trout (*Salvelinus fontinalis*) and lake trout (*Salvelinus namaycush*). The American Fisheries Society listed bull trout as a species of concern in all of its range (California, Idaho, Montana, Nevada, Oregon, Washington; Alberta and British Columbia) except Alaska, as a result of present or threatened destruction, modification, or curtailment of its habitat or range and introduction of exotic species (Williams et al. 1989). Bull trout have been categorized by some as an indicator species of forest and ecosystem health, since many biologists believe bull trout to be particularly sensitive to environmental change (Mongillo 1993; Rieman and McIntyre 1993).

Rangewide, populations are generally isolated and remnant. Migratory life histories have been lost or limited throughout the range (Goetz 1994; Jakober 1995; Montana Bull Trout Scientific Group 1998; Pratt and Huston 1993; Ratliff and Howell 1992; Rieman and McIntyre 1993, 1995) and fluvial bull trout populations in the upper Columbia River portion of the DPS appear to be nearly extirpated. Resident populations existing in headwater tributary reaches are isolated and generally low in abundance (Thomas 1992). Bull trout in Flathead Lake and Lake Pend Oreille appear to be declining, while the Swan Lake adfluvial population appears to be the healthiest remaining population and is increasing (U.S.Department of Interior 1997a). Generally, where status is known and population data exists, bull trout populations in the entire Columbia River DPS are declining (Thomas 1992; Pratt and Huston 1993; Schill 1992). Presently bull trout in the Columbia basin occupy about 45 percent of their estimated historic range (Quigley and Arbelbide 1997). Of the 141 subpopulations, 75 are at risk of natural extirpation through physical isolation. Many of the remaining bull trout occur as isolated subpopulations in headwater tributaries, or in tributaries where the migratory corridors have been lost or restricted. Few bull trout subpopulations are considered "strong" in terms of relative abundance and subpopulation stability. Those few remaining strongholds are generally associated with large areas of contiguous habitats such as portions of the Snake River basin in Central Idaho, the Upper Flathead Rivers in Montana, and the Blue Mountains in Washington and Oregon

D. Analysis of the Species/Critical Habitat Likely to be Affected

The proposed activities will occur in the Lower Clark Fork River Section 7 subbasin currently occupied by bull trout as described in the BA (U.S. Department of Agriculture 1999). Bull trout are listed as threatened under the Endangered Species Act. Critical habitat has not been designated for this species; therefore, none will be affected.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

A. Status of the Species Within the Action Area

The Service evaluated the status and distribution of bull trout for each subpopulation in the Klamath River, Columbia River, St. Mary/Belly River, and Puget Sound distinct population segments. The complete review of this evaluation is found in a status summary compiled by the Service (USDI 1998b, USDI 1999). The following descriptions are for the populations at the subbasin and then local level.

Upper Columbia River Geographic Area

The upper Columbia River geographic area includes the mainstem Columbia River and all tributaries upstream of Chief Joseph Dam in Washington, Idaho, and Montana. Bull trout are found in two large basins, the Kootenai River and Pend Oreille River, which include the Clark Fork River. Historically, bull trout were found in larger portions of the area. Numerous dams and degraded habitat have fragmented bull trout habitat and isolated fish into 71 subpopulations in 9 major river basins (number of subpopulations in each basin)--Spokane River (1), Pend Oreille River (3), Kootenai River (5), Flathead River (24), South Fork Flathead River (3), Swan River (3), Clark Fork River (4), Bitterroot River (27), and Blackfoot River (1).

The upper Columbia River area contains "strongholds" for bull trout. Bull trout are considered strong in Hungry Horse Reservoir and Swan Lake. Trends in abundance are stable in Hungry Horse Reservoir, and increasing in Swan Lake. Although high numbers of bull trout are found in Lake Pend Oreille and the upper Kootenai River, trends in abundance are unknown. However, indications from the Wigwam River, the primary spawning tributary for this population, indicate that this population is currently showing an increasing trend. The high number of subpopulations (27) in the Bitterroot River basin, Montana, indicates a high degree of habitat fragmentation where numerous groups of resident bull trout are restricted primarily to headwaters. The Service considers 50 of the 71 subpopulations at risk of extirpation due to isolation, single life-history form and spawning area, and low abundance.

In summary, the Columbia River distinct population segment of bull trout has declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. In Idaho, for example, bull trout have been extirpated from 119 reaches in 28 streams (IDFG in litt. 1995). The population segment is composed of 141 subpopulations indicating habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin. Although some strongholds still exist, bull trout, generally, occur as isolated subpopulations in headwater lakes or tributaries where migratory fish have been lost.

<u>Lower Clark Fork River Section 7 Watershed</u>

With one exception (Koocanusa Reservoir), all stocks of bull trout on the Kootenai are uncommon to rare and at high risk of extinction (Thomas, 1992). Moderately comprehensive spawning counts in 1993 suggests the historically important (i.e., migratory) populations of bull trout are on the verge of being nonviable if not already below that point. The principal threats to the species include natural environmental fluctuations working in concert with genetic inbreeding, habitat modifications (both direct and indirect), non-native species hybridization and competition, and consumptive use in the fishery.

Bull trout no longer exist throughout most of their historic range. Based on the most recent information available (Thomas 1992) bull trout are found in only 42 percent of their historic range in Montana. In those areas where they do exist they are considered at moderate or high risk of extinction. In Montana, bull trout are considered at moderate risk of extinction in 65 percent of their current range and high risk of extinction in 33 percent of their range. They face high extinction risks due to degraded stream habitat, migration barriers and the presence of exotic fish species.

<u>Lower Clark Fork River, Reservoirs and Associated Tributaries</u>

Construction of the Cabinet Gorge Dam in 1952 eliminated upstream access from Lake Pend Oreille to a substantial portion of the remaining lower Clark Fork River tributaries, including Rock Creek. It also disrupted movement of migrating juvenile bull trout from the tributaries intending to travel downstream to Lake Pend Oreille for maturation to adults. Instead, it appears that some portion of these juvenile fish heading for Lake Pend Oreille were “residualized” in Cabinet Gorge Reservoir and matured there before returning to the tributary streams for spawning. Following construction of Noxon Rapids Dam in 1959, the remaining adult bull trout in Cabinet Gorge Reservoir were prevented from reaching upstream tributaries above Noxon

Rapids Dam and only Pilgrim Creek, Bull River and Rock Creek remained as potential spawning tributaries. Pratt and Huston (1993) concluded that only very small numbers of spawning bull trout existed in Cabinet Gorge Reservoir.

Since the Pratt and Houston (1993) investigations, other studies (WWP 1995a, 1995b, 1996a, and 1996b), have confirmed the small size and tenuous nature of the bull trout populations associated with Cabinet Gorge Reservoir. Extensive sampling since 1993, has found almost no large bull trout in the reservoir or tributaries and evidence of spawning adfluvial fish is lacking. In reservoir tributary reaches accessible to migratory fish, bull trout were the least abundant trout species sampled.

The Montana Bull Trout Scientific Group report (1996) identifies core areas and nodal habitats. Core areas are drainages that contain the strongest remaining populations of bull trout and warrant the most stringent levels of protection. Nodal habitats are waters providing migratory corridors, overwintering areas and other critical habitats. Core areas for the lower Clark Fork River include tributaries; Rock Creek and Bull River. The nodal habitats include Cabinet Gorge Reservoir. Both the restoration plan for bull trout in the Clark Fork River basin in Montana (MBTRT 1998) and the conservation plan for bull trout in Lake Pend Oreille (LPOBTWAG 1999) identify the need to reconnect the Lake Pend Oreille and lower Clark Fork River areas to accomplish restoration goals. Threats and limiting factors identified in the reports include Cabinet Gorge Dam as a barrier to migratory fish movement.

Local Populations - Rock Creek

Currently, bull trout in the Rock Creek drainage are considered to be primarily “resident” populations. However, there have been documented occurrences of larger “migratory” bull trout in the Rock Creek drainage (U.S. Department of Agriculture 1999). Intermittent stream flow for a portion of the year has created a stream population partially isolated from the reservoir. Within the Rock Creek drainage, bull trout are distributed throughout mainstem Rock Creek, the West Fork of Rock Creek, and the East Fork of Rock Creek (U.S. Department of Agriculture 1999). Bull trout are more abundant in the West Fork and East Fork of Rock Creek than in the mainstem. Several attempts at determining the size of the Rock Creek bull trout population were made between 1986 and 1996. Current population estimates based on data collected by Washington Water Power (1996) yield approximately 1,900 bull trout in Rock Creek (Graham 1999, WWP 1996).

The current level of information present on the populations in Rock Creek is minimal and additional information on fish presence, absence, migration and population characteristics are necessary to fully assess the condition of this watershed.

The BA (U.S. Department of Agriculture 1999) concludes that low habitat complexity, limited available suitable spawning and rearing habitat, stream intermittency, and the absence or rarity of the adfluvial form indicate the Rock Creek subpopulation is largely isolated and vulnerable toextinction due to random events.

Species Indicators

The following descriptions correspond to the four species indicators listed on the Service matrix for bull trout (U.S. Fish and Wildlife Service, 1998). Existing conditions for each species indicator are described and rated at a single scale, the CRB 6th code HUC 170102131101. This assessment includes the following tributaries: the mainstem Rock, West Fork Rock, East Fork Rock, and Engle Creeks.

1) Subpopulation (stock) Size--**Functioning at Risk**. Rock Creek bull trout population estimates are based on numbers collected by WWP (1996) and electrofishing by Watershed Consulting (1997). Montana Fish Wildlife and Parks estimates there are 1,900 resident bull trout in the drainage by extrapolating bull trout densities from sample sites over the extent of known suitable habitat as identified by WWP (1996).

2) Growth and Survival--**Functioning at Risk**. This population is affected by isolation from Lake Pend Oreille, cool water habitat conditions in the reservoir, low habitat complexity, limited availability of suitable spawning and rearing habitat, and stream intermittence (WWP 1996). Given these factors it is likely that growth and survival rates are decreased from predevelopment conditions. Mean length for age 1+ individuals was 66 mm and age fish 3+ fish was 157 mm (WWP 1996). Instantaneous survival rate for bull trout was 23 percent to age 3+ in 1994 (WWP 1996). This was lower than for other salmonids in Rock Creek (WWP 1996).

3) Life History Diversity and Connectivity--**Functioning at Risk**. Historic information compiled by Pratt and Huston (1993) indicates this population never had a strong migratory component. Large migratory individuals are infrequently found in the system; however, they are a small component of the population. Lower Rock Creek is ephemeral at summer low flow resulting in a lack of connectivity with the lower Clark Fork River. Historically this population had access to Lake Pend Oreille. Presently Cabinet Gorge Dam is a migration barrier. There is evidence that adfluvial fish move into Rock Creek during spring high flows (WWP 1996).

4) Persistence and Genetic Integrity--**Functioning at Risk**. Brook trout are present in Rock Creek and may compete or hybridize with bull trout. Brook trout commonly compete with bull trout for available food sources, spawning habitat, and rearing habitat. Additionally there is the risk of hybridization between brook trout and bull trout particularly where the largest component of the bull trout population is a resident form.

Table 13. Indicators and Documentation of Baseline for Bull Trout Populations in Rock Creek (USDA 1999, 2000).

INDICATOR	ROCK CREEK VALUES	BASELINE CONDITION
Subpopulation size	Greater than 2000 individual, low habitat complexity, largely isolated population	Functioning at risk
Growth and survival	Growth rates are low and not expected to improve within the next life cycle of bull trout.	Functioning at risk
Life history and diversity	Absence or rarity of the adfluvial component	Functioning at risk
Persistence and Genetic Integrity	Presence and threat of brook trout hybridization in the drainage	Functioning at risk

B. Factors Affecting Species Environment (habitat) Within the Analysis Area.

Lower Clark Fork River

The Montana Bull Trout Scientific Group (1996) concluded the following threats were present in the Lower Clark Fork River. Fragmentation of the historic migratory populations in the Lower Clark Fork River is considered to be the highest risk. Fragmentation has resulted in a smaller, more discrete population unit with less accessible tributary systems. The migratory component of these smaller units is at a higher threat of extirpation due to their limited abundance and available range. Forestry practices have affected primary spawning streams. Other risks to restoration include environmental instability from landslides and rain-on-snow events, thermal problems, rural and residential development, and illegal harvest. The declining abundance of bull trout populations also is considered a risk.

The FERC BA (1999) concluded, based on the licensee's studies (WWP 1995a, 1995b, 1996a, and 1996b), "it is now highly likely that many of the adfluvial bull trout populations that historically existed in the reservoir's tributary streams, and were presumed to be maintaining a remnant population, in fact no longer exist". In other words, the bull trout observed in the tributary streams were either small resident fish or juvenile fish remaining from very few spawning adfluvial fish from the reservoir. The SEIS (1999) concludes that adfluvial bull trout in Cabinet Gorge Reservoir are at risk because of fragmented habitat, migration barriers, small available habitat areas, degraded habitat conditions, low predicted survival to emergence, threats of hybridization with brook trout, and low population size. It is likely that adfluvial bull trout in Cabinet Gorge Reservoir do not represent a viable population.

Rock Creek

Rock Creek is a 4th order drainage with the headwaters in the south western end of the Cabinet Mountains. This watershed drains approximately 21,162 acres. The mainstem Rock Creek consists of C and D Rosgen channel types through much of its lower reaches. The lower section is typified by low gradient, approximately 2 percent, though much of its length. The watershed contains several areas of sensitive landtypes which are presently a chronic sediment source, particularly in the West Fork Rock and Engle Creeks. This has resulted in a large volume of bedload and reduced transport efficiency. The trophic condition of the watershed is characterized by low overall primary and secondary productivity.

The East and West Forks of Rock Creek have gradients of 10.4 and 7.3 percent, respectively (Montana Department of Environmental Quality and U.S. Forest Service 1995). Rubble and gravel are the co-dominant substrate in the lower reaches (WWP 1996). The stream channel and its banks are relatively stable and there is considerable bedload movement. Spawning habitat is limited to isolated pockets of gravel behind stable debris or boulders. The mainstem Rock Creek contains a relatively small amount of LWD relative to other watersheds in the Lower Clark Fork River drainage (WWP 1996). The potential for future recruitment of LWD is greatly reduced due to past riparian harvest and the location of existing roads. Little of the large woody material that enters the active channel is retained.

Habitat conditions in the Rock Creek watershed are somewhat degraded with relatively high levels of sediments present in the spawning gravels and periods of stream flow intermittency occurring in many years (USDA 1999). The past causes of Rock Creek's stressed condition that may have contributed to the degraded habitat include: climate change, riparian logging, road building, geologic events, and the 1910 fire (USDA 1999).

Habitat Indicators

The following descriptions correspond to the 19 habitat indicators listed on the Service matrix for bull trout (USFWS 1998). Existing conditions for each habitat indicator are described and rated at a single scale - the CRB 6th code HUC 170102131101. This assessment includes the following tributaries: the mainstem Rock, West Fork Rock, East Fork Rock, and Engle Creeks.

1) Temperature--**Functioning at Appropriately**. Mean water temperatures were 6.7° C in 1994 (WWP 1996). Low water temperatures ranged from 0.3° C in November up to 12.1° C in August (WWP 1996).

2) Sediment--**Functioning Appropriately**. Watershed surveys have consistently identified three areas that contribute sediment to the Rock Creek system. They include Engle Creek, a slump in the West Fork Rock Creek and the stream banks in the mainstem Rock Creek. Sampling done by Watershed Consulting (1997) measured mean percent fines at 10 percent, 6.8 percent and 1.0 percent in Rock Creek, the East Fork and the West Fork,

respectively. Washington Water Power measured similar levels of fines in Rock Creek with a mean of 10 percent (WWP 1996). Mean Percent fines in the West Fork were higher at 24 percent (WWP 1996).

3) Nutrients and Contaminants--**Functioning Appropriately**. Nutrient levels are low in the Rock Creek Drainage. Total phosphorus concentrations are 8 μg/l and total Kjeldahl nitrogen is 80 μg/l (Montana Department of Environmental Quality and U.S. Forest Service 1995). Productivity in the stream is phosphorus limited. Background contaminants include arsenic cadmium copper lead and zinc which are all naturally present below current detection limits with the exception of zinc at 0.5 μg/l (Montana Department of Environmental Quality and U.S. Forest Service 1995).

4) Physical Barriers--**Functioning at Risk**. The culvert under State Highway 200 has recently been identified as a potential barrier at some flows. Documentation of large migratory individuals above the culvert indicates it is not a barrier at all flows for all size classes of fish. Natural barriers that have been identified include the ephemeral lower reaches of Rock Creek and a waterfall on the West Fork that limits upstream movement.

5) Substrate**--Functioning Appropriately**. Gravel is the dominant substrate in the lower reaches of Rock Creek (WWP 1996; Watershed Consulting 1997) associated with large boulders and cobble (Montana Department of Environmental Quality and U.S. Forest Service 1995). Steeper sections of the mainstem and the East and West Forks are dominated by cobbles (WWP 1996).

6) Large Woody Debris--**Functioning Appropriately**. Large woody debris is limited in the Rock Creek drainage. Potential recruitment of LWD is reduced due to past riparian harvest. This is particularly true below the confluence of the East and West Forks averaging 6.8 pieces per 100 meters (WWP 1996). The upper reaches of the East Fork have high levels of LWD (Montana Department of Environmental Quality and U.S. Forest Service 1995). Average frequency of LWD greater than 10 ft in length was 4.6 pieces per 100 meters in the West Fork (WWP 1996).

7) Pool Frequency--**Functioning at Risk**. Pool frequency is low in the Rock Creek drainage. Most of the available fish habitat is in the form of runs and riffles (WWP 1996). This condition holds true in the low gradient portions of the mainstem Rock Creek.

8) Pool Quality--Functioning at **Unacceptable Risk**. Given the overall low frequency of pools this habitat characteristic also is very low. Stream surveys have consistently identified low pool frequency as a potential aspect for habitat improvement.

9) Off-channel Habitat--**Functioning Appropriately**. Off channel habitat is naturally limited in the Rock Creek drainage. The stream has access to its floodplain but there is limited complexity and potential for back-water areas particularly in the areas of steeper gradient.

10) Prime Habitat (refugia)--**Functioning at Risk**. The majority of available habitat is suitable for smaller resident fish. Lower sections of the stream are affected by riparian harvest, roads, and other management activity. The upper sections of the East and West Forks are less impacted. There is no habitat in the drainage that would currently be considered prime habitat for bull trout.

11) Pool Width/Depth Ratio--**Functioning At Risk**. There are limited pools present in the drainage and no width/depth data for those pools has been collected. Width/depth data has been collected for riffles in the mainstem, East Fork and West Fork by Watershed Consulting (1997). The mean ratios are 29, 37, and 19 respectively. Since the dominant habitat type in the Rock Creek system is riffle and glide habitat types this is an accurate description of available habitat.

12) Streambank Conditions--**Functioning at Risk**. Watershed Consulting (1997) identified the streambanks as a major source of sediment in their surveys. This is in direct contrast to WWP (1996) who found the majority of the mainstem streambanks to be stable. Streambanks in the West Fork and Engle Creek were identified as sediment sources by WWP (1996).

13) Floodplain Connectivity--**Functioning Appropriately**. Connectivity with the Rock Creek floodplain has not been altered by past management activity. Common channel types are Rosgen C and B types with some areas of D channel.

14) Peak and Base Flows--**Functioning at Risk**. Peak flow for Rock Creek is estimated to be between 200 and 300 cfs. Base flow is approximately 2 cfs with a 7-day, 10-year low of 0 cfs (Montana Department of Environmental Quality and U.S. Forest Service 1995).

15) Drainage Network--**Functioning at Risk**. The drainage network in Rock Creek has been altered by past road construction. There are presently 46.1 miles of road on USFS lands within the drainage.

16) Road Network--**Functioning at Risk**. There are 46.1 miles of road within the Rock Creek drainage. This is a road density of 1.5 mi/mi^2 in the Rock Creek drainage. The road density on sensitive landtypes is 2.2 mi/mi^2.

17) Disturbance History--**Functioning at Risk**. Engle Creek has been impacted by fire and past riparian harvest throughout much of its length. There has been extensive riparian harvest in the lower reaches of Rock Creek as well. The whole watershed was affected by the fires of 1889 and 1910. Presently there has been 2,484 acres of regeneration harvest on USFS lands since 1970. Equivalent clearcut acres for the drainage is approximately 12.7 percent.

18) RCHAs--**Functioning at Risk**. The riparian areas for the mainstem Rock Creek have been harvested on much of the private land. Road 150 runs adjacent to Rock Creek for much of its length. Impacts to the riparian area in Engle Creek also are extensive.

19) Disturbance Regime--**Functioning at Risk**. Rock Creek has been through two high water events in the last 5 years with minimal effects to the stream channel. The high flows of 1996 had minimal impacts on the aquatic habitat which would indicate the drainage is able to accommodate moderate to high disturbance and maintain its current level of function.

Integration of Species and Habitat Conditions--**Functioning at Unacceptable Risk**. There are several factors that are critical to this call. Of primary concern is the absence of a migratory life history for this subpopulation in concert with the relatively low habitat complexity and low frequency of pools. This population would likely benefit from an increase in pool habitat and overall complexity. Another reason for concern is the frequency with which the stream goes dry at low flow. If there is a migratory component, access is potentially denied in many years due to subsurface flows. The absence of upstream passage over Cabinet Gorge Dam for juveniles that migrate below Cabinet Gorge Dam further limits productivity. Marginal rearing conditions in Cabinet Gorge Reservoir are an additional constraint to this population (WWP 1995).

Table 14. Indicators and Documentation Habitat Component of Environmental Baseline Conditions in Rock Creek (USDA 1999, 2000).

INDICATOR	ROCK CREEK VALUES	BASELINE CONDITION
Temperature	12°C summer, 9°C spring/fall, 5°C winter.	Functioning Appropriately
Sediment	Range from 10% to 24%.	Functioning Appropriately
Nutrients and Contaminants	Environmental Protection Agency freshwater chronic aquatic life criteria for cadmium, copper, lead, zinc have been exceeded during baseline studies.	Functioning Appropriately
Physical Barriers	Intermittent flow, Culvert barrier during some flows.	Functioning at Risk
Substrate Embeddedness	No Data specific to Embeddedness however, Core Sampling data range from 15.4% to 43.1%.	Functioning Appropriately
Large Woody Debris	Low numbers in mainstem Rock Creek.	Functioning Appropriately
Pool Frequency and Quality	Reduction in pool volume due to sediment loading.	Functioning at Risk
Large Pools	Existing pools are shallow and wide.	Functioning at Unacceptable Risk
Off-channel Habitat	Naturally limited.	Functioning Appropriately
Refugia	Currently not adequate.	Functioning at Risk
Wetted Width/Max. Depth Ratio	Ratio >10.	Functioning at Risk
Streambank Condition	Alluvial terraces are being undermined.	Functioning at Risk
Floodplain Connectivity	Has not been altered.	Functioning Appropriately
Change in Peak/Base Flows	Intermittent flow during some times of the year.	Functioning at Risk
Drainage Network Increase	Roads lack BMP standards.	Functioning at Risk
Road Density and Location	1.5 to 3.0 miles/m2, riparian roads.	Functioning at Risk
Disturbance History	Equivalent Clearcut Area =15%.	Functioning at Risk
Riparian Conservation Areas	Roads and sediment are issues within the RHCA.	Functioning at Risk
Disturbance Regime	Data inadequate.	Functioning at Risk
Integration of Species and Habitat Conditions	**Minimal migratory component, low habitat complexity and low pool frequency.**	**Functioning at Unacceptable Risk**

EFFECTS OF THE ACTION

Effects of the Proposed Action

"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. Direct effects are considered immediate effects of the project on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation.

General Effects of Mining Operations

Extraction of minerals in the United States has affected fishery resources tremendously, and continues to degrade salmonid habitat in many areas. The U.S. Congress passed the Mining Laws Act of 1872, granting top land-use priority to mineral extraction on all public lands not specifically withdrawn from mineral development. As a result, some 300 million hectares (68% of all public land) are open to mining (Sheridan 1983 in Meehan 1991).

Underground mining and the associated above ground development, can negatively affect bull trout by increasing temperatures, creating acid discharge, and mobilizing toxic heavy metals, producing sediment, creating barriers to fish movement, altering stream channel morphology, and altering stream flow (Harvey and Lisle1998, Lee et al.1997, Nelson et al. 1991, Haugen and Duff 1982, and Ott 1985).

Water quality (for example, water temperature, and dissolved oxygen) can be altered by activities associated with mining. Stream temperature is affected by eliminating stream-side shading, disrupted subsurface flows, reduced stream flows, elevated sediments, and morphological shifts toward wider and shallower channels with fewer deep pools. Loss of streamside vegetation reduces the input of material to the stream that will become or create cover for fish in the future as well as result in changes in water temperature regulation (Lee et al. 1997). Dissolved oxygen can be reduced by low stream flows, elevated temperatures, increased fine inorganic and organic materials that have infiltrated into stream gravels retarding intergravel flows (Bustard 1986; Chamberlain et al. 1991). Water quantity can be affected by direct removal of water during offstream operations (Martin and Platts 1981).

Soil and site disturbance that inevitably occur during mill construction and use and other underground mining activities are often responsible for increased rates of erosion and sedimentation to streams (Lee et al. 1997, Haugen and Duff 1981, Martin and Platts 1981). The site disturbance is associated with any number of activities which include such things as removing vegetation from the site, providing vehicular access to the site, installation of stream crossing structures, removal of overburden from the site, re-routing the stream or diverting the stream, construction of settling ponds, and removal/ processing of valuable minerals. The amount of sediment actually delivered to streams will depend on site specific factors. The deposition of fine sediments in salmonid spawning and rearing habitat increases mortality of bull trout embryos, alevins, and fry (Shepard et al 1984, Pratt 1984, Fraley and Shepard 1989, Rieman and McIntyre 1993). Sedimentation effects on salmonids can vary significantly depending on salmonid species, stream channel morphology, and stream flows (Harvey and Lisle 1998). For a substrate oriented salmonid like juvenile bull trout, deposition of fine sediments that fills spaces between rubble could have a very negative effect on survival; especially overwinter survival. This could reduce the amount of rearing habitat available to juvenile and subadult bull trout as well as adult bull trout. Suspended sediment also can have both acute and sublethal effects on salmonids (Noggle 1978 and Sigler et al. 1984). Suspended sediment levels have to be very high to cause lethal effects. Noggle (1978) found young-of-the-year salmonids sustained direct mortality from suspended sediment levels of 1,200 mg/l. Sublethal effects such as reduced growth are much more likely to occur from sedimentation associated with mining. Reduction in growth in various salmonid species has been found to occur at suspended sediment concentrations of 100 to 300 mg/l (McLeay et al. 1984: Sigler et al 1984).

Because the supply of large woody debris to stream channels is typically a function of the size and number of trees in riparian areas, it can be profoundly altered by mining activities that remove vegetation in preparation for mining activities. Removal of streamside trees can greatly alter the amount of woody debris in streams over time (Bisson et al. 1987; Sedell et al. 1988; Robison and Beschta 1990). Shifts in the composition and size of trees within the riparian area affect the recruitment potential and longevity of large woody debris within the stream channel. Large woody debris influences channel morphology, especially in forming pools and instream cover, retention of nutrients, and storage and buffering of sediment. Any reduction in the amount of large woody debris within streams, or within the distance equal to one site-potential tree height from the stream, can reduce instream complexity (Rainville et al. 1985; Robison and Beschta 1990). Large woody debris increases the quality of pools, provides hiding cover, slow water refuges, shade, and deep water areas (Rhodes et al. 1994). Ralph et al. (1994) found instream wood to be significantly smaller and pool depths significantly shallower in intensively logged watersheds. The size of woody debris in a watershed subjected to streamside tree removal in Idaho was smaller than that found in a relatively undisturbed watershed (Overton et al. 1993).

Exposing rock strata to weathering and erosion through removal of vegetation and or overburden can result in higher levels of metals in streams (Ott 1985; Martin and Platts 1981). Metals such as arsenic cadmium, zinc, copper, and mercury all pose risks for aquatic organisms depending on site specific water chemistries. Combinations of several metals can pose even greater risks even though the concentrations for each is below its own toxicity threshold (Borgman 1980). Generally severe metal contamination is more associated with erosion from milled tailings and waste rock or acid mine discharge associated with either open pit or underground mines.

Interrelated and interdependent to many mining activities is road construction, re-construction and use, which results in further adverse effects. Roads built in forested watersheds can cause mass soil movement and surface erosion, resulting in soil creep, slumping, earthflows, and debris avalanches (Meehan 1991). For example, Morrison (1975) found that forest roads produced 344 times more eroded material than was found in undisturbed watersheds.

Roads are recognized as a long-term source of sediment for extended periods even after erosion control measures have been implemented (Furniss et al. 1991, Belt et al 1992). Ground disturbance from road blading, particularly where the road is immediately adjacent to streams and at both intermittent and perennial stream crossings can result in elevated levels of sediment introduction. Ditch maintenance is another source of sediment delivery to streams. Increased erosion occurs within the ditch as a function of cleaning, pulling, or heeling, increased rate of slides in the cutslope (if the cutslope is undercut), and long-term risk of increased sedimentation from vegetation or ditch rock removal within the ditch. Delivery of available sediment to streams can vary substantially depending on the level of best management practices in effect on a given road (Belt et al. 1992). Installation of cross drainage structures and maintenance of buffers between the roads and the streams is a couple of important means which sediment can reduce delivery to streams.

Other activities associated with road activities such as ditch maintenance, culvert cleaning, riprapping, crossing structure activities also may increase sediment delivery to streams. Snowplowing can result in increased erosion of the road surface and fill slopes as thawing occurs in the spring. Water flowing down ruts in plowed roads and water flowing off the road onto fill slopes are the primary cause of increased sediment delivery. Installation of new cross drainage features (BMPs) as well as cleaning existing ones can result in some short term increases in sediment delivery, but will help reduce long term sediment delivery to streams during road maintenance activities.

In addition to roads, there may be effects to bull trout related to the various petroleum products commonly used in mining operations. Petroleum can cause environmental harm by toxic action, physical contact, chemical and physical changes within the soil or water medium, and habitat alteration. Oils spills have caused major changes in local plant and invertebrate populations lasting from several weeks to many years. Effects of oil spills on fish have been difficult to determine beyond the immediate losses in local populations. Drilling fluids, sometimes used in great quantities at mining sites, were found to be toxic to rainbow trout at concentrations less than 100 mg/L (Sprague and Logan 1979). Chemicals used in processing and recovery of metalliferous deposits also may be toxic. Webb et al. (1976) reported that the flotation reagents sodium ethyl and potassium amyl xanthate were highly toxic to brook trout.

While it is unlikely that large numbers of fish inhabiting large, deep bodies of water would be killed by the toxic effects of spilled petroleum, fish kills may be caused by large amounts of oil moving rapidly in shallow waters such as shallow streams. Oils and petroleum products do vary considerably in their toxicity, and the sensitivity of fish to petroleum varies among species. Concentrations of oil in water of 0.5 mg/L or less; however, can be lethal to cutthroat trout (Bowman and Langton 1978). The sublethal effects of oil on fish include changes in heart and respiratory rates, gill hyperplasia, enlarged liver, reduced growth, fin erosion, impaired endocrine system, and a variety of biochemical, blood, and cellular changes, and behavioral responses (Chambers et al. 1979; Barnett and Toews 1978; Weber et al. 1981; Hontela et al. 1992). Therefore, a fuel spill into the stream related to a mining operation could directly poison bull trout or indirectly affect bull trout by poisoning invertebrate or vertebrate prey species.

Specific Effects of Mining Operations on Rock Creek

Impacts related to water quality and quantity as a result of mine operation and construction are expected to affect fish, aquatic macroinvertebrates and plants. Impacts expected include a reduction in numbers of individuals, change in species composition, and reduction in species diversity.

The direct loss of individuals and indirect effects from habitat modifications will affect the overall population, stock viability and likelihood of persistence. Such effects increase the risk of extinction for the specific Rock Creek stock and affect the long-term viability of the Cabinet Gorge "population" by potentially decreasing the available genetic diversity. The Rock Creek stock is comprised largely of "resident" bull trout (USDA 1999) which are at high risk of extirpation from localized catastrophic events due to the limited area and amount of habitat in Rock Creek. Current conditions limiting migratory stock recruitment (Cabinet Gorge Dam) are the biggest threat to the persistence of the migratory life form in this population. Additional threats as a result of the mine will further risk the continued existence of the Rock Creek population.

Changes in habitat conditions also are expected to favor non-native species, primarily brook trout, in overall species composition. Habitat degradation generally favors brook trout populations, thus yielding a competitive edge over bull trout. Brook trout interbreed with bull trout, offspring are most often sterile; however, there has been some evidence of F2 hybrids, an indication of successful breeding of hybrid offspring.

Temperature/Groundwater Influence

Right-of-way clearing within the riparian area is expected as part of this project to facilitate road, powerline and pipeline construction and maintenance. Previous logging activities have already reduced existing shading to the stream, and these activities are expected to add to that cumulative loss (USDA 1999). Additional loss of riparian vegetation may affect stream temperatures within Rock Creek.

The loss of groundwater to interception by the mining activities also is expected to influence temperatures (U.S. Department of Agriculture 1999). Impacts to seeps and wetlands in the area are expected to adversely affect groundwater flows. The groundwater provides both a cooling effect and important spawning and rearing temperatures.

The loss of groundwater recharge and upwellings resulting from the removal and discharge of between 1,700 gpm and 2,046 gpm during mining operations is expected for the life of the mining operations and possibly after mine closure. Groundwater upwelling is important to the success of spawning and successful incubation of eggs to larval stage. The loss of groundwater and the effect to bull trout are difficult to predict and monitoring is proposed to detect any changes.

Substrate Composition/Sediment

The most obvious direct impact of the construction and operation of the Rock Creek Mine to bull trout is the increased level of fine sediments that will enter the stream during the construction phase. Activities associated with the development of the mine include--road construction, road reconstruction, bridge and culvert replacement, installation of Best Management Practices Standards (BMPs) to existing roads, construction and development of tailings ponds, adit and mill sites, powerlines, and pipelines.

The deposition of fine sediments in salmonid spawning and rearing habitat increases mortality of bull trout embryos, alevins, and fry (Shepard et al 1984, Pratt 1984, Fraley and Shepard 1989, Rieman and McIntyre 1993). Sedimentation effects on salmonids can vary significantly depending on salmonid species, stream channel morphology, and stream flows (Harvey and Lisle 1998). For a substrate oriented salmonid like juvenile bull trout, deposition of fine sediments that fills spaces between rubble could have a very negative effect on survival--especially overwinter survival. This could reduce the amount of rearing habitat available to juvenile and subadult bull trout as well as adult bull trout.

Sediment loading is predicted to increase above existing conditions--46 percent in the West Fork of Rock Creek, 20 percent in the East Fork of Rock Creek, and 38 percent overall for the entire Rock Creek watershed (USDA 1999). The highest levels of sediment are expected to occur during the 5-year construction period with decreasing levels of additional sediment entering the stream during the 35-year operating life of the mine. Fine sediment levels in Rock Creek spawning gravels are already at numbers that reduce bull trout survival. Increased sediment levels in spawning gravels are known to lower the survival of salmonid eggs to the emergence stage (Weaver and Fraley 1993). Increases in sediment levels to certain thresholds (more than 30 percent of materials less than 6.4 mm) results in embeddedness that is associated with sharp declines in juvenile bull trout densities (Shepard et al 1984). Very little spawning habitat is available in Rock Creek, and that habitat currently contains high levels of sediment. Any increase in sediment deposition is risk to the productivity of the habitat and the survival rate of bull trout.

Increased embeddedness resulting in decreased aquatic insect production and diversity are effects of increased sediment. Juvenile bull trout feed primarily on aquatic macroinvertebrates and the distribution of aquatic macroinvertebrates inhabiting running water environments is highly dependent on substrate particle size (Cummins and Lauf 1969). Increased levels of deposited sediment reduce the quantity of the food base for bull trout resulting in slower growth rates, higher mortality, and reduced fecundity of bull trout.

An indirect effect of the proposed action relates to impacts of increased levels of sediment on stream habitat characteristics and the effects of those impacts on bull trout and prey availability. Such indirect effects may include changes in stream channel morphology and decreased availability and quality of interstitial spaces affecting rearing habitat, resulting in lower juvenile survival.

Any habitat changes may be aggravated by a decreased availability of water supply to the stream caused by disruption of ground water and surface drainage patterns as well as direct withdrawal of water.

Water Quality/ Metals Concentrations (Discharge Water)

The effects to fish of increased metals concentrations in soft water environments (Rock Creek = 10 mg/l) can result in acute toxicity. Fish are much more susceptible to metals toxicity in soft water environments. Baseline monitoring indicated that copper, cadmium and zinc have exceeded EPA standards prior to any mining activity. Mining activity may further release available metals and add to an increase above baseline conditions. Aquatic organisms are extremely susceptible to increases in metals concentrations (as outlined in the effects of mining discussions).

Groundwater infiltration to Rock Creek of metals contamination also may occur as a result of this project. Impacts to groundwater from waste rock seepage, tailings seepage, tailings impoundment structures and underground mine pool, during operations and upon closure of the mine, are expected in the form of water quality impacts. If the metals concentrations are elevated in the groundwater and then flow to Rock Creek, aquatic organisms would react adversely to those conditions.

A direct effect of discharge of mine treated water and the effluent outfall may be to cause a deterrent to upstream migration for bull trout. Elevated metals levels may cause bull trout to avoid use of Rock Creek as a spawning or rearing area. The metal concentrations in the mixing zones are not expected to be detrimental to fish homing behavior. However, metal concentrations could increase near the mouth of Rock Creek as a result of groundwater seepage and surface erosion of metals from the paste storage facility. If Rock Creek metal concentrations increase to the point they exceed those in the Clark Fork River, then avoidance may be exhibited by fish wanting to reside in the cold water refugia at the mouth of Rock Creek.

Laboratory studies have shown that trout and salmon can detect low levels of metals and actively select lower metals concentrations when given the choice. Woodward et al (1997) documented that Snake River cutthroat trout will avoid mixtures of cadmium, lead, and zinc. Additional tests documented avoidance behavior in cutthroat trout for copper (6 µg/l) and zinc (28 µg/l) Woodward et al. (1995) showed that brown trout avoided mixtures where copper and zinc were present in concentrations as low as 6.5 and 32 µg/l, respectively. Further, fish acclimated for 90 days to zinc at 55 µg/l, preferred lower concentrations (28 µg/l), when given the choice.

Field studies also have documented the avoidance of metal concentrations by wild fish. Sprague et al. (1965) and Saunders and Sprague (1967) documented the effects of metals (primarily copper and zinc) originating from hardrock mining activities on the movements of spawning Atlantic salmon in New Brunswick. They estimated the threshold avoidance for a metals mixture to be 17-21 µg/l for copper and 210-258 µg/l for zinc.

Because bull trout have not been tested for avoidance, predictions for behavior in Rock Creek are difficult. However, the above listed criteria are considered conservative estimates for avoidance behavior associated with copper and zinc concentrations. The MPDES currently allows concentrations less than those identified in the effects analysis.

The mine operations are expected to operate within guidelines established by the Clean Water Act and all applicable State of Montana water /environmental quality laws. Those guidelines are established, administered and enforced by EPA and MDEQ.

Catastrophic Risk

Catastrophic failure of the tailings impoundment or paste facility would have significant and long term impacts to aquatic organisms downstream of the project (SDEIS 1998). It is difficult to estimate or predict the magnitude or long term effects of such an event; however, significant impacts would be probable.

Tailings impoundments and stormwater issues can be exceeded and cause failure of the facilities. Monitoring and mitigation plans are expected to address the necessary requirements to minimize impacts in the event of a spill.

Direct and indirect effects are likely to occur if a pipeline rupture or vehicle accident occurs resulting in slurry or hazardous substances entering Rock Creek (USDA 1999). The slurry pipeline, water reclaim line, or discharge pipeline could leak or break, potentially spilling its contents to Rock Creek. Trucks carrying reagents or concentrate also are at risk of accidents and spill to bull trout waters. Although time, location, and extent of the events are unpredictable, such events as occurred at ASARCO's nearby Troy mine in 1984 are likely to occur during the life of the mine (DEIS). Factors that add to the risks associated with spills include--frequency and number of trucks hauling, weather, proximity of the road to live water, effectiveness of spill response equipment and frequency and thoroughness of maintenance of facilities. In addition to direct effects on fish, such events may result in chronic and long term effects on the habitat's ability to support bull trout.

B. Species' Response to a Proposed Action

The expected response to the ongoing mining operations is associated with impacts to the aquatic habitat and the resultant impacts to the individuals and bull trout populations.

Given the previously described degraded conditions of the watersheds, increases in sedimentation, changes in channel and habitat complexity are expected to adversely affect bull trout populations from the proposed mining plan of operation and the associated activities. Short term increases in sediment and changes in habitat complexity are considered more than insignificant or inconsequential. Those activities will affect aquatic habitat as well as the associated life history stages of bull trout in the Rock Creek watershed. Risks associated with groundwater development, metals contamination and catastrophic events also are inherent to a proposal of this magnitude and considered threats to bull trout populations.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of this Act.

The primary risk to bull trout populations identified in the Lower Clark Fork subbasin are fragmentation of the historic migratory populations caused by mainstem hydroelectric dams. Forestry practices and mining activities have further degraded existing habitat. Other risks include environmental instability from landslides and rain on snow events, illegal harvest, thermal barriers, and rural/ residential development (MBSG 1996a).

The evidence of impacts to migratory fish use by Cabinet Gorge Dam is well documented (WWP 1998, Pratt and Huston 1993). Pre-impoundment population estimates for migratory adult bull trout range between 2,000 and 10,000 for the lower Clark Fork River (Pratt and Huston 1993). There has been a distinct decrease in the relative abundance and frequency of bull trout upstream of Cabinet Gorge Dam. The existing reservoirs have provided an inadequate surrogate for Lake Pend Oreille. Habitat conditions within the reservoirs are largely unsuitable for bull trout (WWP 1995a) and can be considered degraded by State of Montana Standards as they pertain to supporting a cold water fishery. This shift in habitat suitability is evidenced by the highly successful bass fishery and dominance by generalist fishes (WWP 1996b). Bull trout populations within the project area “are small enough to prompt concern about both available genetic diversity and population persistence” (SEIS 1998). Presently, Cabinet Gorge acts as a sink for individual fish form Rock Creek predisposed to downstream migration. Any individuals moving past the dam are lost from the Rock Creek population.

Ongoing mitigation tied to the relicensing of the Avista owned Lower Clark Fork Project 2058 includes research to describe the Rock Creek bull trout population and available habitat. Additional mitigation are being used to support the Rock Creek Watershed council and implement watershed research and restoration to benefit bull trout.

Cumulative effects of the subbasin are reflected in bull trout population numbers and life history forms. All subbasins are at risk of increased activities and concern for the viability and effects to bull trout populations has been summarized by the MBSG (1996a).

CONCLUSION

Jeopardy Analysis (Columbia Basin Distinct Population Segment)

After reviewing the current status of the Columbia Basin DPS of bull trout, the environmental baseline for the action area, the effects of the proposed mining operations and the cumulative effects, it is the Service's biological opinion that the actions as proposed, are **not likely to jeopardize the continued existence of the Columbia Basin DPS of bull trout, as listed.** This conclusion is based on the magnitude of the project effects in relation to the listed population at the Columbia River basin scale. No critical habitat has been designated for this species, therefore, none will be affected.

Effects to Individuals (Rock Creek Drainage)

The proposed mining operation complies with the Kootenai Forest Plan as amended by INFISH, but has the determination of **May Affect, Likely to Adversely Affect** because the impacts to individuals in the Rock Creek drainage were considered more than insignificant and inconsequential. The effects of the mining operation have been minimized to the extent possible with the use of BMP's, forest plan standards and site specific considerations. There also is a potential for take of bull trout that has been addressed in the following incidental take statement.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Proposed Mining Plan of Operations in the Lower Clark Fork River Basin--Rock Creek Mine

This incidental take statement is based on the future refinement and approval of monitoring and mitigation plans by Sterling Mining Company, in concert with the MDEQ, the Kootenai, and the Service. Appendix H of the DEIS contains a complete description of the monitoring and mitigation plans to be developed by MDEQ and the Kootenai.

The regulatory agencies will address the refinement and review of the monitoring plans as an interagency team. Not all of the plans listed in Appendix H of the DEIS directly affect the fishery; however, if they do, it is important to review the relevant plans and provide input from a fisheries perspective to ensure impacts to bull trout are minimized. The Service will participate as needed; however, expects that the Forest Fishery Biologist, Forest Hydrologist, Forest Geologist, and Forest Soil Scientist will be involved in issues related to water use, fishery monitoring plans, sediment abatement plans and monitoring, and groundwater issues.

Monitoring and mitigation plans to be refined, approved and ultimately included in the plan of operations (as outlined in Appendix H of the DEIS) include:

Air Quality Monitoring
Rock Mechanics Monitoring
Acid Rock Drainage and Metals Leaching Plan
Evaluation Adit Data Evaluation Plan
Tailings Paste Facility and Tailings Surry Line Construction Monitoring Plan
Soils and Erosion Control Plan
Reclamation Monitoring Plan
Water Resources Monitoring Plan
Influent and Effluent Monitoring Plan
Monitoring of Biological Oxygen Demand Plan
Wildlife Mitigation an Monitoring Plan
Threatened and Endangered Species Mitigation Plan
Aquatics and Fisheries Monitoring and Mitigation Plan
Hard Rock Mining Impact Plan
Wetlands Mitigation Plan

Amount or Extent of Take Anticipated

The Service anticipates that activities associated with the proposed mining operation will result in some incidental take of bull trout in the form of harm, harassment or mortality related to expected degradation of aquatic habitat parameters including spawning habitat, rearing habitat and food supply and the related risk to bull trout life history stages. Increases in sedimentation, degradation of water quality, changes in channel and habitat complexity related to mining activities are anticipated to adversely affect and likely result in a take of the egg, larval and juvenile life history stages by harming or impairing feeding, breeding and sheltering patterns of adult and juvenile bull trout. The USFS anticipates that the activities with the likelihood of harm and harassment will continue for approximately 35 years, the life of the plan of operations (USDA 1999). **However, mine operation could exceed that timeframe and it is likely that long term effects of mining operations will continue indefinitely after mine closure.** Risks associated with groundwater development, metals contamination and catastrophic events also are inherent to a proposal of this magnitude and considered threats to bull trout populations. These actions contribute to the overall risk to bull trout in the Lower Clark Fork River drainage and Reasonable and Prudent Measures must be taken to minimize take.

The amount of take expected in the Rock Creek (HUC # 17010213403) watershed is difficult to quantify because of--the wide ranging distribution of bull trout, identification and detection of dead or impaired species at the egg and larval stages is unlikely, losses may be masked by seasonal fluctuations in numbers and aquatic habitat modifications are difficult to ascribe to particular sources, especially in already degraded watersheds. In addition, the effects of management actions associated with the mining operations are largely unquantifiable in the short term and may only be measurable in the long-term effects to the species or population levels. Therefore, even though the Service expects incidental take to occur from the effects of mining, the expected level of take is "unquantifiable."

To ensure protection for a species assigned an unquantifiable level of take due to mining related activities, reinitiation is required if the Terms and Conditions are not adhered to and/or the magnitude of the mining activities exceed the scope of this opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the species (bull trout) at the Columbia Basin Distinct Population Segment, as listed. No critical habitat has been designated, therefore none will be affected.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of bull trout:

1. Complete a watershed assessment of the Rock Creek watershed to define bull trout populations, habitat conditions and existing sediment sources in the basin. This is to be done in consultation with the Rock Creek Watershed Council, the Kootenai, and the Service. Incorporate, as appropriate, any additional findings into monitoring and mitigation plans.

    a. Implement a fish monitoring program to document the current status of Rock Creek bull trout and the effect of mitigation activities on Rock Creek bull trout stocks. Include studies to define bull trout distribution, densities, age class structures, growth rates, fecundity and status of resident and migratory (adfluvial) populations.

    b. Implement an assessment of existing habitat conditions for bull trout. Include assessment of spawning, rearing and overwintering conditions for resident and adfluvial bull trout populations. Also include temperature monitoring to establish baseline conditions for bull trout.

    c. Implement a stream habitat enhancement program that improves the ability of bull trout to move throughout the year in Rock Creek and increases habitat availability and diversity for migratory and resident bull trout populations. Include in this assessment any alternatives and designs for stream diversion to be constructed around the paste facility.

d. Identify sediment sources currently impacting Rock Creek and plan, design, and implement sediment abatement measures to reduce sediment input to the stream prior to initiation of any ground disturbing activities not related to adit exploration and development. This plan should identify existing sediment sources such as--culverts, road impacts, bridges, past bank stabilization efforts and utility right of way impacts. Complete a road systems analysis to define existing and future road uses and closures.

e. Implement a sediment monitoring program to document the ongoing condition of Rock Creek and the effect of mitigation activities on sediment levels, and the actual effect of project activities and proposed mitigation actions on sediment levels in the drainage.

2. Evaluate all possible operations of the existing effluent location or relocating the effluent outfall discharge pipe to a location that will eliminate any potential impacts to bull trout related to project effects on migrating or holding fish moving into Rock Creek from the Clark Fork River.

3. Implement a metals monitoring program that includes monitoring levels of metal concentrations in water, sediments and fish tissues. This could be incorporated in several conceptual monitoring plans including, but not limited to, the Aquatics and Fisheries Monitoring and Mitigation Plan.

4. Identify key spawning areas and implement a monitoring program of changes in groundwater influence for spawning and rearing bull trout. This will be incorporated into the groundwater monitoring program.

5. Complete a risk assessment of failure related to haul routes and mine related vehicle traffic. Incorporate any additional measures identified to minimize the risk of failures and the associated impacts to bull trout.

6. Implement reporting and consultation requirements as outlined in the following terms and conditions.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Kootenai must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions are established to implement reasonable and prudent measure No. 1:

Upon the of issuance of the letter of approval for the Rock Creek Project, the Kootenai will require the applicant to initiate baseline studies for use in a complete watershed assessment of Rock Creek. The Kootenai will require the applicant to complete and submit the watershed assessment to the USFS and Service prior to surface disturbance activity *not* related to the evaluation adit stage of the project.

The assessment will include information to define bull trout populations, habitat conditions and existing sediment sources in the basin and will address the following issues for bull trout:

a. A monitoring plan to document bull trout populations in Rock Creek. That monitoring plan will include studies to define bull trout distribution, densities, age class structures, and status of migratory (adfluvial) populations.

b. An assessment of current habitat conditions for bull trout. The assessment will include information on quantity and quality of spawning, rearing and overwintering conditions for resident and adfluvial bull trout populations.

c. An assessment of possible sediment mitigation and reduction projects within the Rock Creek basin as outlined in the proposed action. Recommendations of stream enhancement projects should be included in that assessment.

d. A feasibility assessment (including engineering options, conceptual designs, estimated costs and expected sediment load effects) for sediment abatement measures that will reduce sediment levels in the Rock Creek drainage. This assessment will include any designs for the proposed stream diversion around the proposed paste facility and a complete roads analysis and recommendations associated with mine activities and proposed mitigation projects.

    (1) The sediment abatement program shall reduce the sediment levels in Rock Creek by approximately 38 percent (the projected increase in sediment levels attributable to development of the mine as described in the BA) prior to surface disturbance activity **not** related to the evaluation adit stage of the project.

    (2) Upon of completion of the feasibility assessment (1. d., above), the Kootenai will require the applicant to complete design and permitting requirements, in consultation with MDEQ, the Kootenai, and the Service, and begin construction of such sediment abatement measures as agreed to by the USFS and the Service.

e. Upon the issuance of the letter of approval for the Rock Creek Project, the Kootenai will require the applicant to complete and submit to the USFS and the Service a sediment monitoring plan that will adequately assess the current and long-term status of sediment levels in Rock Creek. The sediment monitoring plan will be developed in consultation with MDEQ, the Kootenai Forest and the Service and will address the entire USFS permit time period. This also will include a complete assessment of the effectiveness of the sediment abatement program in the Rock Creek drainage. If the assessment concludes, and the Service agrees, that the sediment abatement program failed to substantially reduce sediment levels in Rock Creek, then the applicant will prepare an assessment of other measures that could be implemented in the Rock Creek drainage and will be completed in a time frame agreed to by the Service.

2. The following terms and conditions are established to implement reasonable and prudent measure # 2:

   a. Prior to surface disturbance activity **not** related to the evaluation adit stage of the project, the Forest will require the applicant to complete, and submit to USFS and the Service, an evaluation of operational options with existing diffuser location and alternative locations for siting the diffuser entering the Clark Fork River below Noxon Dam. The evaluation will be prepared in consultation with the Forest, Montana Department of Environmental Quality and the Service and will focus on recommendations that will minimize potential effects on migrating or resident bull trout utilizing the Clark Fork River habitats adjacent to the mouth of Rock Creek and the spring area immediately upstream. The Service will ultimately approve the evalutation.

   b. If the evaluation identifies a more appropriate operation or location for the diffuser (2. a., above), the USFS will require the applicant to modify the plan of operations, as agreeable to the Service, to incorporate the alternative most likely to minimize impacts to bull trout.

3. The following terms and conditions are established to implement reasonable and prudent measure #3:

   a. Prior to surface disturbance activity **not** related to the evaluation adit stage of the project, the applicant shall submit a plan to the Forest and the Service for metals monitoring as it relates to bull trout habitat requirements that includes monitoring in water samples, sediment samples and fish samples. This monitoring will start prior to mine development to establish the baseline, and continue during operations and post operations as determined necessary by the Forest and the Service. The Service will ultimately approve the plan.

4. The following terms and conditions are established to implement reasonable and prudent measure #4:

   a. Prior to surface disturbance activity **not** related to the evaluation adit stage of the project, the Forest shall require the applicant to submit a plan to the Forest and the Service for monitoring of groundwater effects as they relate to bull trout habitat requirements. This monitoring will start prior to mine development to assess the baseline, and continue during operations and post operations as determined necessary by the Forest and the Service. The Service will ultimately approve the plan.

5. The following terms and conditions are established to implement reasonable and prudent measure #5:

    a. Prior to surface disturbance activity *not* related to the evaluation adit stage of the project, the Kootenai shall require the applicant to submit a risk assessment of accidents related to haul routes for mine related vehicle traffic to the Kootenai and the Service for evaluation. The assessment will determine areas most at risk for bull trout and make recommendations for additional measures and responses to minimize risk. If any additional measures can be incorporated to minimize the risk of catastrophic failures, the Kootenai, MDEQ, and the Service will determine the timeline and mechanism for implementation of those identified measures.

6. The following terms and conditions are established to implement reasonable and prudent measure # 6:

    a. The Kootenai will require the applicant to annually prepare and submit to the Service a report of the mining year activities as well as the next year's proposed activities.

    b. Upon locating dead or injured bull trout or upon observing destruction of redds, notification must be made within 24 hours to the Montana Field Office at 406-449-5225. Record information relative to the date, time, and location of dead or injured bull trout when found, and possible cause of injury or death of each fish and provide this information to the Service.

    c. During project development and operation the USFS or applicant shall promptly notify the Service of any emergency or unanticipated situations arising that may be detrimental for bull trout relative to the proposed activity.

    d. Within 90 days of the end of each year, the USFS or applicant will provide a written report or letter to the Service indicating the actual number of bull trout taken, if any, as well as any relevant biological/habitat data or other pertinent information on bull trout that was collected.

    e. The Kootenai shall assure consistent implementation of measures and standards specified in the Aquatic Conservation strategies as indicated in the 1998 Biological Opinion for the Effects to Bull Trout from the Continued Implementation of Land and Resource Management Plans and Resource Management Plans as Amended by the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada (INFISH), and the Interim Strategy for Managing Anadromous Fish-producing Watershed in Eastern Oregon and Washington, Idaho and portions of California (PACFISH).

f. To better monitor mitigation measures identified, the Forest will provide summaries to the Service of all INFISH compliance, water quality and fish population monitoring conducted in conjunction with these mining operations.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service expects that take of bull trout will be a result of the impacts to instream habitat associated with increases in sediment, modifications to water quality, and modifications of instream habitat conditions for the life of the mining operations and reclamation activities. **It is likely that long term effects of mining operations will continue indefinitely after mine closure.** If, during the course of the action, the project descriptions are not adhered to, the level of incidental take anticipated in the biological opinion may be exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. This may require suspension of mining operations. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Service recognizes the impacts of past mining, roading and logging actions on watersheds on the Kootenai National Forest. For the benefit of the watershed and listed bull trout, the Service encourages the Forest to seek funding to reclaim and restore impacts from previous impacts.

2. The Service recognizes and appreciates the Kootenai National Forest and Sterling Mining Company's involvement with the Rock Creek Watershed Council. We encourage continued participation and development of actions to further restore native fish populations in the Rock Creek drainage.

3. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if---(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely,

Ralph O. Morgenweck

Regional Director

REFERENCES--GRIZZLY BEAR

Aune, K. 1985. Rocky Mountain front grizzly bear monitoring and investigation. Montana Department Fish Game and Wildlife. Helena. 139 pp.

Aune, K.A., and W.F. Kasworm. 1989. Final report: East front grizzly studies. Montana Department of Fish, Wildlife and Parks, Helena. 332 pp.

Aune, K.A., and T. Stivers. 1985. Ecological Studies of the Grizzly Bear in the Pine Butte Preserve. Montana Department Fish Wildlife And Parks. Helena. 154 pp.

Christenson, A.G., and M.J. Madel. 1982. Cumulative effects analysis process. U.S. Forest Service, Kootenai National Forest, Libby, Montana 53pp.

Craighead, F.C., and J.J. Craighead. 1972a. Grizzly bear prehibernation and denning activities as determined by radio tracking. Wildlife Monographs 32. 35 pp.

Craighead, F.C., and J.J. Craighead. 1972b. Radio tracking of grizzly bears and elk in Yellowstone National Park, Wyoming, 1959-1960. pp 55-62 *in* P.H. Oehser, ed. National Geographic Society Research Reports, 1955-1960. National Geographic Society, Washington, D.C.

Craighead, J.J., J.S. Sumner, and J.A. Mitchell. 1995. The grizzly bears of Yellowstone: their ecology in the Yellowstone ecosystem, 1959-1992. Island Press, Washington, D. C. 535 pp.

Dood, A.R, R.D. Brannon, and R.D. Mace. 1986. Management of grizzly bears in the Northern Continental Divide ecosystem. Transaction of the North American Wildlife Natural Resources Conference 51pp.

Egbert, A.L., and A.W. Stokes. 1976. The social behavior of brown bears on an Alaskan Salmon Stream. International Conference on Bear Research and Management 3:41-56.

Erickson, A.W. 1978. Grizzly bear management in the Cabinet Mountains of western Montana. U.S. Forest Service, Kootenai National Forest, Libby, Montana 82pp.

Falconer, D.S. 1981. Introduction to quantitative genetics, second ed. Longman, London & New York, NY.

Glenn, L.P., J.W. Lentfer, J.B Faro, and L.H. Miller. 1976. Reproductive biology of female brown bears (Ursus arctos), McNeil River, Alaska. Pages 381-390 *in* M.R. Pelton, J. W. Lentfer, and G. E Folk, Jr., eds. Bears–their biology and management. IUCN Publ. New Series 40.

Harding, L., and J.A. Nagy. 1980. Responses of grizzly bears to hydrocarbon exploration on Richards Island, Northwest Territories, Canada. Int. Conf. Bear Biol. And Manage. 3:277-280.

Harris. R.B. 1986. Modeling sustainable harvest rates for grizzly bears. In: Final programmatic environmental impact statement for the grizzly bear in northwestern Montana. 1986. Mont. Dept. Fish, Wildl. And Parks. Helena. 287 pp.

Herrero, S. 1978. A comparison of some features of the evolution, ecology, and behavior of black and grizzly/brown bears. Carnivore 1(1):7-17.

Hornocker, M.G. 1962. Population characteristics and social and reproductive behavior of the grizzly bear in Yellowstone National Park. M.S. Thesis, Montana State University. 94 pp.

Interagency Grizzly Bear Committee. 1987. Grizzly bear compendium. National Wildlife Federation, Washington, D.C. 540 pp.

Interagency Grizzly Bear Committee. 1994. Interagency Grizzly Bear Committee -Taskforce report: grizzly bear/motorized access management. U.S. Forest Service, Missoula, Montana 7 pp.

Interagency Grizzly Bear Committee. 1998. Interagency Grizzly Bear Committee--Taskforce report: Selkirk/Cabinet-Yaak grizzly bear recovery areas, interim access management rule set. 8 pp.

Jonkel, C., and I. M.Cowan. 1971. The black bear in the spruce-fir forest. Wildlife Monographs 27:55 pp.

Jope, K.L. 1983. Habituation of grizzly bears to people, a hypothesis. Int. Conf. Bear Res. and Manage. 5:322-327.

Kasworm, W.F., and T.L. Manley. 1988. Grizzly bear and black bear ecology in the Cabinet Mountains of northwest Montana. Montana Department of Fish, Wildlife, and Parks, Helena. 122 pp.

Kasworm, W.F., and T.L. Manley. 1990. Road and trail influences on grizzly bears and black bears in northwest Montana. Int. Conf. Bear Res. and Manage. 8:79-84.

Kasworm, W.F., and T.J. Thier. 1994. Cabinet-Yaak ecosystem grizzly bear and black bear research 1993 progress report. U.S. Fish and Wildlife Service, Missoula, Montana 57 pp.

Kasworm, W.F., and T.J. Thier, and C. Servheen. 1995. Cabinet-Yaak ecosystem grizzly bear and black bear research 1994 progress report. U.S. Fish and Wildlife Service, Missoula, Montana 42 pp.

Kasworm, W.F., H. Carriles, and T.G. Radandt. Cabinet-Yaak grizzly bear recovery area 1999 research and monitoring progress report. U.S. Fish and Wildlife Service, Missoula, Montana. 48 pp.

Kistchinksii, A.A. 1972. Life history of the brown bear (*Ursus arctos L.)* in northeast Siberia. Pages 67-73 *in* S. Herreo ed. Bears--their biology and management. IUCN Publ. New Series 23.

Lasley, J.F. 1984. Genetics of livestock improvement, 3rd edition. Prentice-Hall, Englewood Cliffs, NJ. 492pp.

Lehmkuhl, J.F. 1984. Determining size and dispersion of minimum viable populations for land management planning and species conservation. Environmental Management 8:167-176.

Mace, R.D., and T.L. Manley. 1993. South Fork Flathead River grizzly bear project: progress report for 1992. Montana Deptartment of Fish, Wildlife and Parks, Helena. 34 pp.

Mace, R.D., J.S. Waller, T.L. Manley, L.J. Lyon, and H. Zuuring. 1996. Relationships among grizzly bears, roads and habitat in the Swan Mountains, Montana. British Ecological Society. Journal of Applied Ecology, 33, 1395 - 1404.

Mace, R.D., J.S. Waller, T.M. Manley, K. Ake, and W.T. Wittinger. 1999. Landscape evaluation of grizzly bear habitat in western Montana. Conserv. Biol. 13:367-377.

Mattson, D.J., and R.R. Knight. 1991. Effects of access on human-caused mortality of Yellowstone grizzly bears. U.S. National. Park Service. Interagency Grizzly Bear Study Team Report 1991B, Bozeman, Montana 13 pp.

Mattson, D.J., R.R. Knight, and B.M. Blanchard. 1987. The effects of developments and primary roads on grizzly bear habitat use in Yellowstone National Park, Wyoming. International Conference on Bear Research and Management. 8:57-64.

Mattson, D.J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. Journal of Wildlife Management. 56:432-442.

McLellen, B.N., and R. Mace. 1985. Behavior of grizzly bears in response to roads, seismic activity and people. Preliminary report. Canada Border Grizzly Project, Cranbrook, B.C. 53 pp.

McLellen, B.N. 1989. Effects of resource extraction industries on behavior and population dynamics of grizzly bears in the Flathead drainage, British Columbia and Montana. Ph.D. Thesis, University of British Columbia, Vancouver. 116 pp.

McLellen, B.N, and D.M. Shackleton. 1988. Grizzly bears and resource extraction industries: effects of roads on behavior, habitat use and demography. Journal of Applied Ecology. 25:451-460.

McLellen, B.N, F.W. Hovey, R.D. Mace, J.G. Woods, D.W. Carney, M.L. Gibeau, W.L. Wakkinen, W.F. Kasworm. 1999. Rates and causes of grizzly bear mortality in the interior mountains of British Columbia, Alberta, Montana, Washington, and Idaho. Journal of Wildlife Management 63(3):911-920.

Miller, S., and W.B.Ballard. 1982. Homing of transplanted Alaskan brown bears. Journal of Wildlife Management. 46(4): 869-876 *in* IGBC, 1987. Grizzly bear compendium, The National Wildlife Federation. 540 pp.

Montana Department of Commerce. 1999. Montana county information website, November, 2000.

Montana Department Of Environmental Quality and U.S. Forest Service. 1995. Draft environmental impact statement Asarco Rock Creek project. Montana Department of Environmental Quality, Helena, Montana and Kootenai National Forest, Libby, Montana.

Montana Department Of Environmental Quality and U.S. Forest Service. 1998. Draft supplemental environmental impact statement Asarco Rock Creek project. Montana Department of Environmental Quality, Helena, Montana and Kootenai National Forest, Libby, Montana.

Mundy, K.R.D., and D.R. Flook. 1973. Background for managing grizzly bears in the national parks of Canada. Canadian Wildlife Service Report. Series No. 22. 35 pp.

Murie, A. 1944. The wolves of Mount Mckinley. U.S.D.I. National Park Service Fauna serial No. 5. U.S. Gov. Printing Office, Washington, D. C. 238 pp.

Murie, A. 1962. Mammals of Mount McKinley National Park, Alaska. Mount McKinley Natural Historical Association 56 pp.

Pearson, A.M. 1975. The northern interior grizzly bear *Ursus Arctos L.* Canadian Wildlife Service Report Serial Number 34, Ottawa. 86 pp.

Reynolds, P.E., H.V. Reynolds, and E.H. Follman. 1986. Responses on grizzly bears to seismic surveys in northern Alaska. Int. Conf. Bear Res. And Manage, 6:169-176.

Rogers L.L., and S.M. Rogers. 1976. Parasites of bears: a review. International Conference on Bear Research and Management. 3: 411-430.

Russell, R.H., J.W. Nolan, N.G. Woody, G.H. Anderson, and A.M. Pearson. 1978. A study of the grizzly bear (Ursus Arctos) in Jasper National Park: A progress report 1976 and 1977. Parks Canada, prepared by Canadian Wildlife Service, Edmonton, Alberta. 95 pp.

Servheen, C., F. Hovey, B. McLellen, R. Mace, W. Wakkinen, W. Kasworm, D. Carney, T. Manley, K. Kendall, and R. Wielgus. Unpublished. Draft: Report of the Northern Ecosystems researchers on grizzly bear population trends in the North and South Forks of the Flathead River, and the Blackfeet Indian Reservation of the NCDE; the Cabinet-Yaak ecosystem; the Selkirk ecosystem; and future data needs to improve trend estimates. Unpublished report to the IGBC, December 14, 1994, Denver, CO. 12 pp.

Schoen, J.W., L.R. Beier, J.W. Lentfer, and L.J. Johnson. 1987. Denning ecology of brown bears on Admiralty and Chichagof islands. Int. Conf. Bear Biol. And Manage. 7:293-304.

Spreadbury, B. 1984. Yukon Grizzly Bear Transplant Project. Year 1 progress report, prepared for Yukon Fish and Wildlife Branch, Environment Canada, Yukon Fish and Game Association and University of Calgary *in* IGBC, 1987. Grizzly bear compendium. National Fish and Wildlife Foundation. 540 pp.

Swenson, J.E., F. Sandegren, S. Brunberg and P. Wabakken. 1997. Winter den abandonment by brown bears Ursus arctos: causes and consequences. Wildl. Biol. 3(1):35-38.

Templeton, A.R., and B. Read. 1983. The elimination of inbreeding depression in a captive herd of Speke's gazelle. Pp. 241-261 in; C. M. Schonewald-Cox, S. M. Chambers, B. MacBryde, and L. Thomas (eds.), Genetics and Conservation. The Benjamin/Cummings Publishing Co., Menlo Park, CA. 722pp.

Thier, T.J. 1981. Cabinet Mountains grizzly bear studies, 1979 - 1980. Border Grizzly Project special report number 50. University of Montana, Missoula. 64pp.

U.S. Census Bureau. 2000. Estimates of Montana’s resident population: Counties. Website, November 15, 2000.

U.S. Fish and Wildlife Service. 1982. Biological opinion on the Lolo National Forest Plan. U.S. Fish and Wildlife Service., Helena, Montana 8pp.

U.S. Fish and Wildlife Service. 1983. Biological opinion on the 1982 proposed Kootenai National Forest Plan. U.S. Fish and Wildlife Service., Helena, Montana 8pp.

U.S. Fish and Wildlife Service. 1985. Biological Opinion on the 1985 proposed Kootenai National Forest Plan. U.S. Fish and Wildlife Service., Helena, Montana 8pp.

U.S. Fish and Wildlife Service. 1987. Draft Environmental Assessment - grizzly bear population augmentation test, Cabinet-Yaak ecosystem. U.S. Fish and Wildlife Service, Missoula, Montana 65pp.

U.S. Fish and Wildlife Service. 1993a. Grizzly bear recovery plan. U.S. Fish and Wildlife Service, Missoula, Montana 181 pp.

U.S. Fish and Wildlife Service. 1993b. Biological Opinion. U.S. Fish and Wildlife Service, Helena, Montana.

U.S. Fish and Wildlife Service. 1995a. Notes of December 6, 1994 meeting with the Kootenai National Forest. U.S.Fish and Wildlife Service, Helena, Montana 4 pp.

U.S. Fish and Wildlife Service. 1995b. Notes of August 28, 1995 meeting with the Kootenai National Forest. U.S. Fish and Wildlife Service, Helena, Montana 5 pp

U.S. Fish and Wildlife Service. 1995c. Incidental Take Statement: Amendment to June 26, 1985 biological opinion on the Kootenai National Forest Plan. U.S. Fish and Wildlife Service, Helena, Montana 15 pp

U.S. Fish and Wildlife Service. 1995d. Biological opinion on amendment 19 to the Flathead National Forest Plan. U.S. Fish and Wild. Service, Helena, Montana 61pp.

U.S. Fish and Wildlife Service. 1996a. Incidental Take Statement: Amendment to 1982 biological opinion on the Lolo National Forest Plan. U.S. Fish and Wildlife Service, Helena, Montana

U.S. Fish and Wildlife Service. 1996b. Letter dated March 1, 1996 from Wayne Kasworm to Kevin Shelley. U.S. Fish and Wildlife Service, Helena, MT. 2pp.

U.S. Fish and Wildlife Service. 1996c. Final biological opinion on the construction and operation of the Montanore project. U.S. Fish and Wildlife Service, Denver, CO. 45 pp.

U.S. Fish and Wildlife Service. 1996d. Final biological opinion on the salvage timber harvest in bear management unit 10 of the Cabinet/Yaak ecosystem. U.S. Fish and Wildlife Service, Helena, Montana. 57 pp.

U.S. Fish and Wildlife Service. 1997a. Letter dated March 17, 1999 from Wayne Kasworm to Whom it may concern. U.S.Fish and Wildlife Service, Helena, MT. 11 pp.

U.S. Fish and Wildlife Service. 1997b. Meeting notes of January 22 - 23, 1997 meeting between the U.S. Fish and Wildlife Service and U.S. Forest Service in Libby, Montana U.S.Fish and Wildlife Service, Helena, MT. 6 pp.

U.S. Fish and Wildlife Service. 1998. Letter and analysis dated February 2, 1998 from Al Bratkovich to Kevin Shelley. U.S. Fish and Wildlife Service, Helena, MT. 26 pp.

U.S. Fish and Wildlife Service. 2000. Grizzly bear recovery in the Bitterroot ecosystem final environmental impact statement. U.S. Fish and Wildlife Service, Denver, CO.

U.S. Forest Service. 1982. Lolo national forest plan. Lolo National Forest, Missoula, Montana.

U.S. Forest Service. 1986. Interagency grizzly bear guidelines. U.S. Forest Service, Missoula, Mont. 100 pp.

U.S. Forest Service. 1987. Kootenai national forest plan. Kootenai National Forest, Libby, Montana.

U.S. Forest Service. 1996. Forest assessment of 1994 major fires: Kootenai National Forest 1994. U.S.Forest Service, Kootenai National Forest, Libby, Montana 15 pp.

U.S. Forest Service. 1997a. Biological assessment for threatened, endangered, and proposed species: Skranak/Harpole Access. Libby Ranger District, Kootenai National Forest, Libby, Montana 32 pp.

U.S. Forest Service. 1997b. Mineral potential and activity forecast - Skranak/Harpole access Environmental Impact Statement. Forest geologist file report dated December 16, 1997. Kootenai National Forest, Libby, Montana 3pp.

U.S. Forest Service. 1998. Forest plan monitoring and evaluation report fiscal year 1997, Kootenai National forest. Kootenai National Forest, Libby, Montana 121pp.

U.S. Forest Service. 1999. Forest plan monitoring and evaluation report fiscal year 1998, Kootenai National forest. Kootenai National Forest, Libby, Montana 78pp.

U.S. Forest Service. 2000. Forest plan monitoring and evaluation report fiscal year 1999, Kootenai National forest. Kootenai National Forest, Libby, Montana 78pp.

U.S. Forest Service. 2000b. Harpole/Skranak Record of Decision. Kootenai National Forest, Libby, Montana.

U.S. Forest Service, Idaho Department Fish and Game, Washington Department Wildlife, U.S. Fish and Wildlife Service, and Montana Department of Fish, Wildlife, and Parks. 1988. Cumulative effects analysis process for the Selkirk/Cabinet-Yaak grizzly bear ecosystems. 32 pp.

U.S. Forest Service, Montana Department of State Lands, Montana Department of Health and Environmental Sciences, and Montana Department of Natural Resources and Conservation. 1992. Final environmental impact statement Noranda Minerals Corp. Montana Reserves Company joint venture Montanore project.

U.S. Forest Service, Montana Department of State Lands, Montana Department of Health and Environmental Sciences, and Montana Department of Natural Resources and Conservation. 1993. Record of Decision Noranda Minerals Corp. Montana Reserves Company joint venture Montanore project.

Wakkinen, W.J. and B.K. Johnson. 2000. Selkirk Mountains Grizzly Bear Ecology Project. December 1998-1999. E-14-5. Idaho Department of Fish and Game. Boise, ID. 38 pp.

Wakkinen, W.J. and W.F. Kasworm. 1997. Grizzly bear and road density relationships in the Selkirk and Cabinet-Yaak Recovery Zones for the Interagency Grizzly Bear Committee. U. S. Fish and Wildlife Service. Libby, Montana 28 pp.

Wright, S. 1977. Interbreeding in animals: differentiation and depression. Pp 44-96 in: S. Wright, Evolution and the genetics of populations. Volume 3. University of Chicago Press, Chicago, IL. 613pp.

Zager, P. E. 1980. The influence of logging and wildfire on grizzly bear habitat in northwestern Montana. Ph.D. Dissertation, University of Montana, Missoula. 131 pp.

REFERENCES–BULL TROUT

Allan, J.H. 1980. Life history notes on the dolly varden char (*Salvelinus malma*) in the Upper Clearwater River, Alberta. Manuscript Report. Energy and Natural Resources, Fish and Wildlife Division. Red Deer, AB. 58 pp.

Barrett, J.C., G.D. Grossman and J. Rosenfeld. 1992. Turbidity-induced changes in reactive distance of rainbow trout. Transaction of the American Fisheries Society 121:437-443.

Baxter, C.V., C.A Frissell and F.R. Hauer. 1999. Geomorphology, Logging Roads, and the Distribution of Bull Trout Spawning in a Forested River Basin: Implications for Management and Conservation. Transactions of the American Fisheries Society 128:854-867.

Belt et al 1992. USDA in litt 1999.

Bisson P. A. 1987. Large woody debris in forested streams in the pacific Northwest: Past present, and future. Cited IN: Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams et al.. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. IN: T.M. Quigley and S. J. Arbelbide eds “An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III?. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405).

Bjornn, T.C. and J. Mallet. 1964. Movements of planted and wild trout in an Idaho river system. Transactions of the American Fisheries Society 93:70-76.

Bjornn, T.C. and D.W. Reiser. 1991. Habitat Requirements of Salmonids in Streams. American Fisheries Society Special Publication 19:83-138. (As referenced in USDI, FWS 1997).

Borgman 1980. USDA in litt.

Bowman and Langton. 1978. USDA in litt.

Buckman, R.C., W.E. Hosford, and P.A. Dupee. 1992. Malheur River Bull Trout Investigations. Pages 45-57 In Howell, P.J. and D.V. Buchanan, Eds. Proceedings of the Gearhart Mountain Bull Trout Workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.

Bustard, D. R. 1986. Some differences between coastal and interior streams and the implications to juvenile fish production. Canadian Technical Report of Fisheries and Aquatic Sciences 1483:117-126.

Cavender, T.M. 1978. Taxonomy and Distribution of the Bull Trout, *Salvelinus confluentus* (Suckley), from the American Northwest. California Fish and Game 64:139-174.(As referenced in USDI, FWS 1997).

Chambers et al. 1979. USDA in litt 1999.

Chamberlain, T.W., R. D. Harr, and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. American Fisheries Society Special Publication 19:181-205.

Cummins, K.W. and G.H. Lauff. 1968. The influence of substrate particle size on the microdistribution of stream benthos. Hydrobiologia 34: 145-181.

Dambacher, J.M. and K.K. Jones. 1997. Stream habitat of juvenile bull trout populations in Oregon and benchmarks for habitat quality. In: Mackay, W.C., M.K. Brewin and M. Monita, Friends of the Bull Trout Conference Proceedings. May 1994. Calgary, CA.

Edwards, R. Personal communication. University of Washington, Seattle, Washington

Evermann, B.W. 1892. Report of the Commissioner of Fish and Fisheries reflecting the establishment of fish-cultural stations in the Rocky Mountain Region and Gulf States. 52D Congress, Senate, Miscellaneous Document Number 65, U.S. Government Printing Office, Washington, D.C.

Fraley, J.J., and B.B. Shepard. 1989. Life History, Ecology and Population Status of Migratory Bull Trout (*Salvelinus confluentus)* in the Flathead Lake and River System, Montana. Northwest Science 63(4):133-143.

Federal Regulatory Energy Commission (FERC) 1999. Biological Assessment on the effects of Cabinet Gorge, Noxon and Thompson Falls Dams. On File at USFWS, Helena, MT.

Furniss, M.J., T.D. Roelofs, and C.S. Yee. 1991. Road construction and maintenance. American Fisheries Society Special Publication 19:297-323.

Goetz, F. 1989. Biology of the Bull Trout "*Salvelinus confluentus*," a Literature Review. Willamette National Forest, Eugene, Oregon. (As referenced in USDI, FWS 1997).

Goetz, F.A. 1994. Distribution and Juvenile Ecology of Bull Trout (Salvelinus confluentus) in the Cascade Mountains. Corvallis, OR: Oregon State University. M.S. thesis. (As referenced in USDI 1997b).

Graham, P.J., B.B. Shepard, and J.J. Fraley. 1981. Use of Stream Habitat Classifications to Identify Bull Trout Spawning Areas in Streams. In Acquisition and Utilization of Habitat Inventory Information: Proceedings of the Symposium. October 28-30, 1981. Portland, OR. American Fisheries Society, Western Division. P. 186-190.

Graham, P. 1999. Comment letter on proposed Rock Creek Mine. On file at USFWS, Helena, MT.

Haas, G.R. and J.D. McPhail 1991. Systematics and distributions of dolly varden (Salvelinus malma) and bull trout (Salvelinus confluentus) in North America. Can.J. Fish. Aquatic Sciences 48:2191-2211.

Harvey B.C. and and T.E Lisle. 1998. Effects of suction dredging on streams; a review and an evaluation strategy. Fisheries Vol 23 (8), pgs 8-17.

Haugen G., D. Duff, et al.. 1982. The Best Management Practices for the Management and Protection of Western Riparian Ecosystems. Riparian habitat committee, Western Division American Fisheries Society.

Hontela et al. 1992. In litt USDA 1999.

IDFG. 1995. Assessment and conservation strategy for bull trout. Idaho Department of Fish and Game, Boise, ID.

Jakober, M.J. 1995. Influence of Stream Size and Morphology on the Seasonal Distribution and Habitat Use of Resident Bull Trout and Westslope Cutthroat Trout in Montana. Bozeman, MT: Montana State University. M. S. thesis. (As referenced in USDI 1997b).

Lake Pend Oreille Bull Trout Watershed Assessment Group (LPOBTWAG) 1999. On file at USFWS, Helena, MT.

Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow and J.E. Williams. 1997. Chapter 4: Broadscale assessment of aquatic species and habitats. In :Quigley, T.M. and S.J. Arbelbide, tech. eds., An assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great Basins: Volume III. General Technical Report PNW-GTR-405.. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management.

Leary, R.F.; F.W. Allendorf, and S. H. Forbes. 1993. Conservation Genetics of Bull Trout in the Columbia and Klamath River Watersheds. Conservation Biology. 7:856-865. (As referenced in USDI 1998a).

Martin S. B. and W.S. Platts. 1981. Effects of Mining. General Technical Report PNW-119, U.S Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.

McLeay D.J., I.K. Birtwell, G.F. Hartman, and G.L. Ennis. 1987. Response of Arctic Grayling to acute and prolonged exposure to Yukon placer mining sediment. Canadien Journal of Fisheries and Aquatic Sciences 44: 658- 673.

McPhail, J.D. and C.C. Lindsey. 1986. Zoogeography of the freshwater fishes of Cascadia (the Columbia system and rivers north to Stikine). Pages 615-638 in: Hocutt, C.H., et al. The Zoogeography of North American Freshwater Fishes. John Wiley and Sons, New York, NY.

McPhail, J.D., and C. Murray. 1979. The Early Life History and Ecology of Dolly Varden (*Salvelinus malma*) in the Upper Arrow Lakes. Report to the British Columbia Hydro and Power Authority and Kootenay Dept. of Fish and Wildlife. University of British Columbia, Department of Zoology and Institute of Animal Resources, Vancouver, B.C.(As referenced in USDI, FWS 1997a and b).

Meehan, W. R., and T. C. Bjornn. 1991. Salmonid Distribution and Life Histories. in Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19:47-82.

Meisner, J.D. 1990. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19.

Mongillo, P.E. 1993. The distribution and status of bull trout/dolly varden in Washington State-June 1992. Washington Department of Wildlife, Olympia, WA.

Montana Bull Trout Scientific Group. 1996. Lower Clark Fork River Drainage, Bull Trout Status Report. Prepared for The Montana Bull Trout Restoration Team. Helena, MT.

Montana Bull Trout Scientific Group. 1998. The relationship between land management activities and habitat requirements of bull trout. prepared for: The Montana Bull Trout Restoration Team, Montana Fish, Wildlife, and Parks, Helena. (Bull Trout - B120).

Montana Department of Environmental Quality and Kootenai National Forest 1998. Supplemental Draft Environmental Impact Statement, ASARCO Rock Creek Project. On file at USFWS, Helena, MT.

Montana Department of Environmental Quality and Kootenai National Forest 2000. Draft Final Environmental Impact Statement, ASARCO Rock Creek Project. On file at USFWS, Helena, MT.

Montana Department of Environmental Quality and U.S. Forest Service. 1995. Draft Environmental Impact Statement ASARCO Rock Creek Project, Volume 1. Helena Montana.

Morrison, 1975. Ecological and geomorphological consequences of mass movements in the Alder Creek watershed and implications for forest land management. Bachelor's thesis. University of Oregon, Eugene.

Nelson R. L. M. L. McHenry, and W.S. Platts. 1991. Mining; Chapter 12. In: Meehan W.R. (Editor). Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19, pages 425-457.

Noggle C. C. 1978. Behavioral, physiological, and lethal effects of suspended sediments on juvenile salmonids. Masters Thesis. University of Washington Seattle.

Ott A.G. 1985. Fish Protection and Placer Mining. Alaska Fish and Game. March-April 1985 issue.

Overton C. K. Radko M. A. and R.L. Nelson 1993. Fish habitat conditions; using the northern/intermountain Regions inventory procedures for detecting differences on two differently managed watersheds. Ge Tech. Rept INT-300, Ogden, UT. US Dept of Agriculture, Forest Service, Intermountain Research Station. 14 p.

Oliver, G.G. 1979. Fisheries Investigations in Tributaries of the Canadian Portion of the Libby Reservoir. Fish and Wildlife Branch, Kootenay Region. (As referenced in USDI, FWS 1997).

Pratt, K.L. and J.E. Huston. 1993. Demographic and habitat requirements for conservation of bull trout. USDA, Forest Service, Int. Res. Stn., GTR-302, Ogden, Utah.

Pratt, K.L. 1984. Pend Oreille Trout and Char Life History Study. Idaho Department of Fish and Game, Boise, Idaho.

Pratt, K.L. 1992. A Review of Bull Trout Life History. Proceedings of the Gearhart Mountain Bull Trout Workshop. Pages 5-9 In Howell, P.J. and D.V. Buchanan, eds. Proceedings of the Gearhart Mountain Bull Trout Workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.

Pratt, K.L., and J.E. Huston. 1993. Status of Bull Trout (*Salvelinus confluentus*) in Lake Pend Oreille and the Lower Clark Fork River: Draft. The Washington Power Company, Spokane, Washington. (As referenced in USDI, FWS 1997).

Quigley, T.M. and S.J. Arbelbide. 1997. An Assessment of Ecosystem Components in the Interior Columbia Basin and Portion of the Klamath and Great basins: Volume III. Pages 1,057 - 1,713. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 vol. (Quigley, T.M., tech. ed.; The Interior Columbia Basin Ecosystem Management Project: Scientific Assessment.

Rainville R.C., Rainville S.C. and E. L. Lider. 1985. Riparian silvicultural strategies for fish habitat emphasis. Cited IN: Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams et al.. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. IN: T.M. Quigley and S. J. Arbelbide eds ?An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III". U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405).

Ralph S. C. Poole G.C., Conquest L.L. and R.J. Naiman. 1994. Stream channel morphology and woody debris in logged and unlogged basins of western Washington. Canadien journal of Fisheries and Aquatic Sciences 51: 37-51.

Ratliff, D.E. 1992. Bull Trout Investigations in the Metolius River- Lake Billy Chinook System. Pages 37-44 In Howell, P.J. and D.V. Buchanan, eds. Proceedings of the Gearhart Mountain Bull Trout Workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.

Ratliff, D.E., and P.J. Howell. 1992. The Status of Bull Trout Populations in Oregon. Pages 10-17 in Howell, P.J. an d D.V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon chapter of the American Fisheries Society, Corvallis.(As referenced in USDI, FWS 1997a).

Reiland, E. 2000. Personal Communication. Montana Department of Fish Wildlife and Parks, Missoula, MT.

Rhodes J. J. McCullough D.A., and F. A. Espinosa. 1994. A coarse screening process for potential application in ESA consultations. Columbia river Intertribal Fish Commission. Cited IN: Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams et al.. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. IN: T.M. Quigley and S. J. Arbelbide eds ?An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III". U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405).

Riehle, M.D. 1993. Metolius Basin Water Resources Monitoring, Progress Report 1988-1992. U.S. Department of Agriculture, Forest Service, Discoids National Forest, Bend Oregon. (As referenced in USDI 1997b).

Rieman, B.E. and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. General Technical Report INT-302, Intermountain Research Station, USDA Forest Service, Boise, Idaho. (Bull Trout - B58).

Rieman, B.E. and J.D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions American Fisheries Society 124(3):285-296 (Bull Trout - B100).

Rieman, B.E. and J.D. McIntyre. 1996. Spatial and temporal variability in bull trout redd counts. North American Journal of Fisheries Management 16:132-141. (Bull Trout - B133).

Rieman, B. B., D. Lee, J. McIntyre, K. Overton, and R. Thurow. 1993. Consideration of Extinction Risks for Salmonids. Fish Habitat Relationships Technical Bulletin, No. 14, December. USDA Forest Service, Intermountain Research Station. Boise, Idaho. 14pp.

Robinson G. E. and R. L. Beschta. 1990. Identifying trees in riparian areas that can provide coarse woody debris to streams. Forest Science: 36: 790-801.

Sanders R.L. and J. B. Sprague 1967. Effects of copper-zinc mining pollution on a spawning migration of Atlantic salmon. Water Research 1:419-432.

Schill, D.J. 1992. River and stream investigations. Idaho Department of Fish and Game. Boise, ID.

Shepard, B. B., S.Leathe, T. Weaver, and M. Enk. 1984. Monitoring levels of fine sediment within tributaries to Flathead Lake and impacts of fine sediment on bull trout recruitment. IN: Proceedings of the Wild Trout III Symposium. Mammoth Hot Springs, Yellowstone national park, Wyoming. Sept 24-25, 1984.

Shepard, B.B., Fraley, J.J., Weaver, T.M., and Graham, P. 1982. Flathead River Fisheries Study - 1982. Montana Department of Fish, Wildlife and Parks, Helena, 157pp. (Bull Trout - B7).

Schmetterling, D. 2000. Personal Communication. Montana Department of Fish, Wildlife and Parks, Missoula, MT.

Sidell et all 1988. In litt USDA 1999.

Siegler, J. W. , T.C. Bjornn, and F.H. Everest. 1984. Effects of chronic Turbidity on density and growth of steelhead and coho salmon. Transactions of the American Fisheries society 113: 142-150.

Sprague, J.B., and W. J. Logan. 1979. Separate and joint toxicity to rainbow trout of substances used in drilling fluids for oil exploration. Environmental Pollution 19:269-281.

Starnes L. B. and D. C. Gasper. 1996. Effects of Surface mining on Aquatic Resources in North America. Fisheries, Vol 21 (5), 24-26.

Thomas, G. 1985. Experimentally determined impacts of a small suction gold dredge on a Montana Stream. N. Am Journal Fisheries Management. 5: 480-488.

Thomas, G. 1992. Status Report: Bull trout in Montana. Montana Department of Fish, Wildlife and Parks, Helena, 61pp. (Bull Trout - B1).

USDA 1999. Bull trout biological assessment for Rock Creek Mine. USDA Forest Service. Kootenai National Forest. Libby, Montana.

USDA Forest Service 1997. Suction Dredging in the National Forest.

USDA Forest Service. 1995. Inland Native Fish Strategy Environmental Assessment. USDA Forest Service Publication.

USDA Forest Service, Kootenai National Forest. 2000. Watershed baseline information for Rock Creek Watershed. Libby, MT.

USDI, Fish and Wildlife Service. 1997a. Endangered and Threatened Wildlife and Plants; Proposal to List the Klamath River Population Segment of Bull Trout as an Endangered Species and the Columbia River Population Segment of Bull Trout as a Threatened Species. June 13, 1997. Federal Register 62(114):32268-32284.

USDI, Fish and Wildlife Service. 1997b. Draft. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. Region 1, USFWS. December 1997. 35 p.

USDI, Fish and Wildlife Service. 1998a. A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Action at the Bull Trout Subpopulation Watershed Scale. Region 1, USFWS. February 1988. 45p.

USDI, Fish and Wildlife Service. 1998b. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. June 10, 1998. Federal Register 62(111):31647-31674.

USDI, Fish and Wildlife Service. 1998c. Klamath River and Columbia River bull trout population segments: status summary and supporting documents lists. Prepared by bull trout listing team. USFWS.

USDI, Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Coterminous United States; Final Rule. November 1, 1999. Federal Register 64(521):58910-58933.

Washington Water Power (WWP). 1995. Fish Community Assessment on Cabinet Gorge and Noxon Rapids Reservoir. The Washington Water Power Company, Spokane, WA. 40 pp., and Appendices.

Washington Water Power (WWP). 1995. 1994 Water Quality and Limnologic Evaluations on the Lower Clark Fork River. The Washington Water Power Company, Spokane, WA. 43 pp., and Appendices

Washington Water Power (WWP). 1998. Final Report: Historic and Current Resourcesfor the Washington Water Power Cabinet Gorge and Noxon Rapids Hydrologic Projects. The Washington Water Power Company, Spokane, WA.

Washington Water Power (WWP). 1996. Lower Clark Fork River Tributary Survey. The Washington Water Power Company, Spokane, WA. 232 pp.

Watershed Consulting. 1997. 1996 Field data summary report for Rock Creek near Noxon, Montana: final. Watershed Consulting, Polson, Montana.

Weaver T. M. and J. J. Fraley. 1993. A method to measure emergence success of westslope cutthroat trout fry from varying substrate compositions in a natural stream channel. North American Journal Fisheries management 13: 817-822.

Weaver T. M. and J.J. Fraley. 1991. Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program: Fisheries habitat and Fish Populations. Flathead Basin Commission, Kalispell, Montana.

Weaver, T.M. and R.G. White. 1985. Coal Creek Fisheries Monitoring Study No. III. Quarterly Progress Report. Montana State Cooperative Fisheries Research Unit, Bozeman, MT.

Weaver, T.M. 1992. Coal Creek Fisheries Monitoring Study No. X and Forest-wide Fisheries Monitoring-1991. Kalispell, MT: Montana Department of Fish, Wildlife, and Parks, Special Projects. 35p. (As referenced in USDI 1998a)

Webb 1981. In litt USDA 1999.

Weber et al. 1981. In litt USDA 1999.

Williams, J.E., J.E. Johnson, D.A. Hendrickson, S. Contreras-Balderas, J.D. Williams, M. Navarro-Mendoza, D.E. McAllister and J.D. Decon. 1989. Fishes of North America: endangered, threatened, or of special concern: 1989. American Fisheries Society 14(6):2-20.

William, R.N., R.P. Evans and D.K. Shiozawa. 1997. Mitochondrial DNA diversity patterns of bull trout in upper Columbia River Basin. In: Mackay, W.C., M.K. Brewin and M. Monita, eds., Proceedings - Alberta friends of the Bull Trout, May 1994. Trout Unlimited, Bull Trout Task Force. Calgary, Alberta

Woodward, D. F., J.A. Hansen, H. L. Bergman, E.E. Little, and A.J. DeLonay. 1995. Brown trout avoidance of metals in water characteristic of the Clark Fork River, Montana. Canadian Journal of Fishery and Aquatic Sciences 52:2031-2037.

Woodward, D.F., J.N. Goldstein, and A.M. Farag. 1997. Cutthroat trout avoidance of metals and conditions characteristic of a mining waste site: Coeur d'Alene River, Idaho. Transactions of the American Fisheries Society 126:699-706.

Ziller, J.S. 1992. Distribution and Relative Abundance of Bull Trout in the Sprague River Subbasin, Oregon. Pages 18-29 In Howell, P.J. and D.V. Buchanan, eds. Proceedings of the Gearhart Mountain Bull Trout Workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.

Appendix A
Complete Alternative V Description
(As provided by Montana Department of Environmental Quality)
Rock Creek Project with Tailings Paste Deposition and Alternate Water Treatment

COMPLETE ALTERNATIVE V DESCRIPTION
Rock Creek Project with Tailings Paste Deposition and Alternate Water Treatment

The Rock Creek Project is a proposed 10,000-ton-per-day underground copper and silver mine in northwestern Montana. The project is proposed and would be operated by Sterling Mining Company (Sterling). The mine, mill, and other facilities would be located in Sanders County, Montana, about 13 miles northeast of Noxon, Montana (see Figures 1 and 2). The project is similar in scope and operation to the inactive Troy Mine in Lincoln County, Montana. Sterling currently holds mineral rights under the Cabinet Mountains Wilderness (CMW) and acquired title to the minerals by using the minerals patent process of the 1872 Mining Law. The purpose of the proposed action is to develop these interests.

Alternative V would consist of two phases: construction of an evaluation adit and its support facilities, and then construction of the mine, mill, tailings paste facility, rail loadout, reverse osmosis and passive biotreatment facility, and various pipelines and access roads. The Bottom-Up construction option for the paste facility would be used and final design would incorporate measures to meet visual impact mitigation and reclamation goals. Some mine water would be stored in underground workings during mine operation, but most excess water would be discharged to the Clark Fork River after treatment. Environmental requirements in addition to those proposed by Sterling would be incorporated to avoid and minimize (to the extent possible) or eliminate environmental impacts to numerous resources. Additional monitoring would help detect trends as well as unacceptable impacts, should they occur. Measures would be developed to respond to and control any unacceptable impacts that may be detected.

The proposed permit boundary would encompass 1560 acres, of which 482 acres are proposed to be disturbed and 1078 would remain undisturbed (see Table 1). Land encompassed by the proposed permit boundary is 48 percent privately held and 52 percent NFS lands.

Table 1. Alternative V
Surface Disturbance Acreage (net acres impacted)[1]

Disturbance Type	Acres
Tailings Paste Facility & Associated Components[2]	368
Transportation Corridor	65
Mill Facilities	31
Water Treatment Facility	10
Mine Portal and Related Facilities[3]	0
Wilderness Air Intake Ventilation Adit[3]	0.02
Evaluation Adit	8
Total Acres Disturbed	482

[1] Total disturbance for each mine facility has been rounded to the nearest whole number.
[2] The rail loadout facility is not included as it is not a regulated facility and would be constructed wholly on privately owned lands. It would disturb about 5 acres.
[3] There are no separate mine portal facilities disturbances as it would be contained within the mill site. However, the wilderness ventilation adit is included to show its small acreage of disturbance in the Cabinet Mountain Wilderness Area.

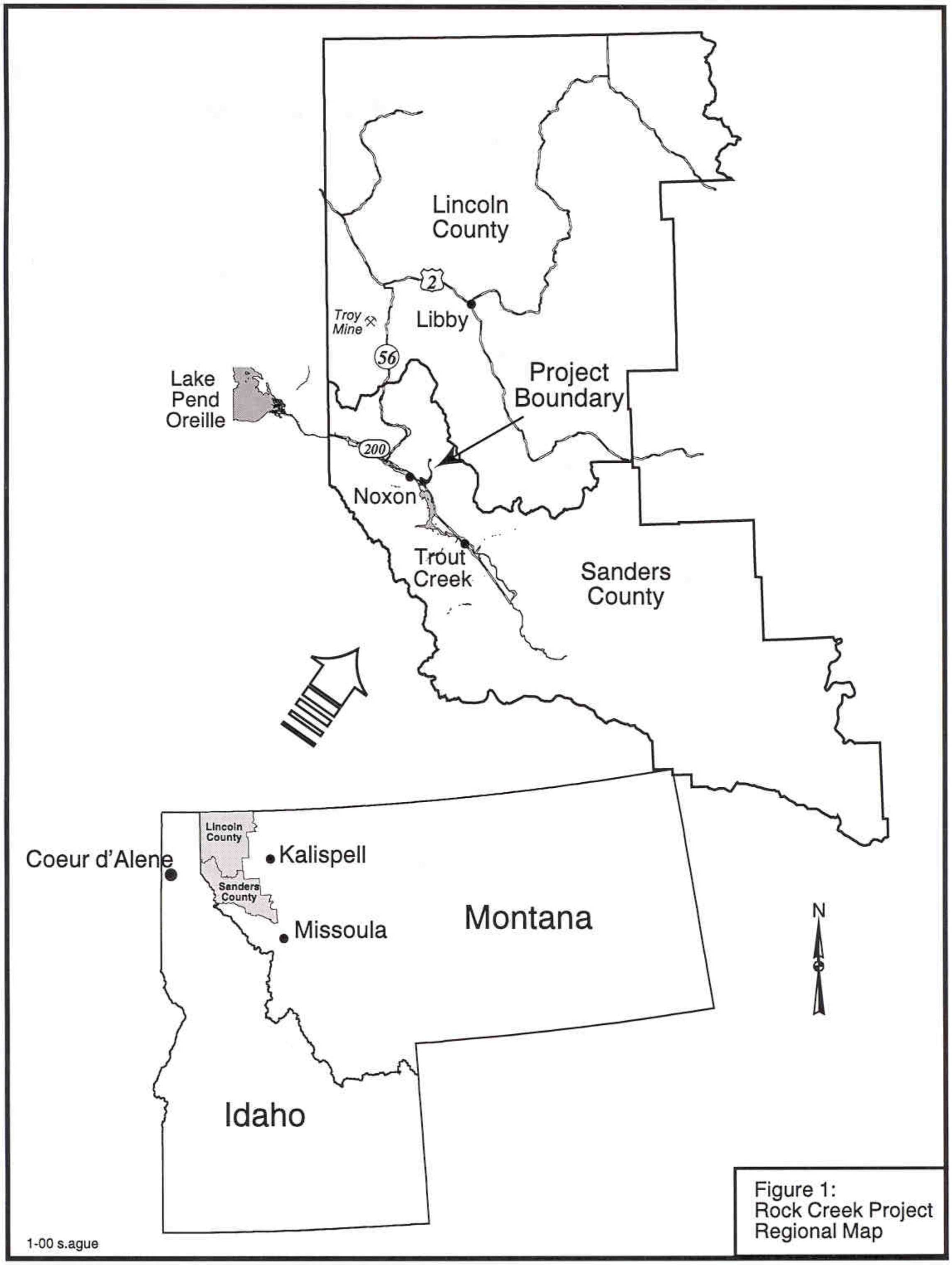


Figure 1:
Rock Creek Project
Regional Map

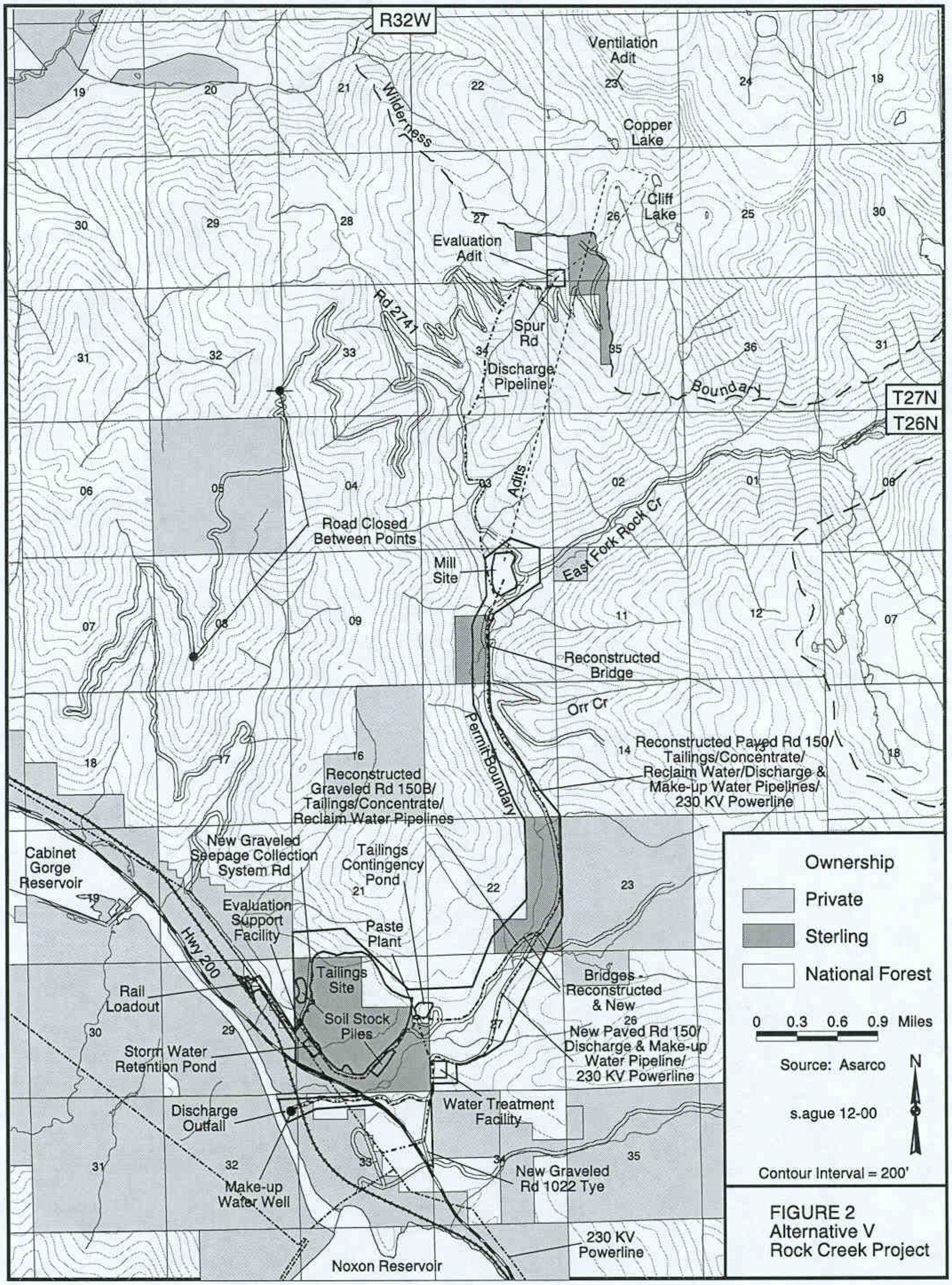


FIGURE 2
Alternative V
Rock Creek Project

Evaluation Adit

The proposed evaluation adit would be driven prior to other work on the Rock Creek Project in an attempt to better understand the configuration of the ore body. During the mine production phase, this adit would serve as an additional ventilation (exhaust) opening and as a secondary escapeway, when the two adits met. Conventional mining methods would be employed for the 1-year evaluation adit construction period. Existing roads would provide access and an estimated 8.3 acres would be disturbed. While most of the pertinent information about the evaluation adit is included below more details on the evaluation adit can be found in the Rock Creek Evaluation Adit License Application (ASARCO Incorporated 1992).

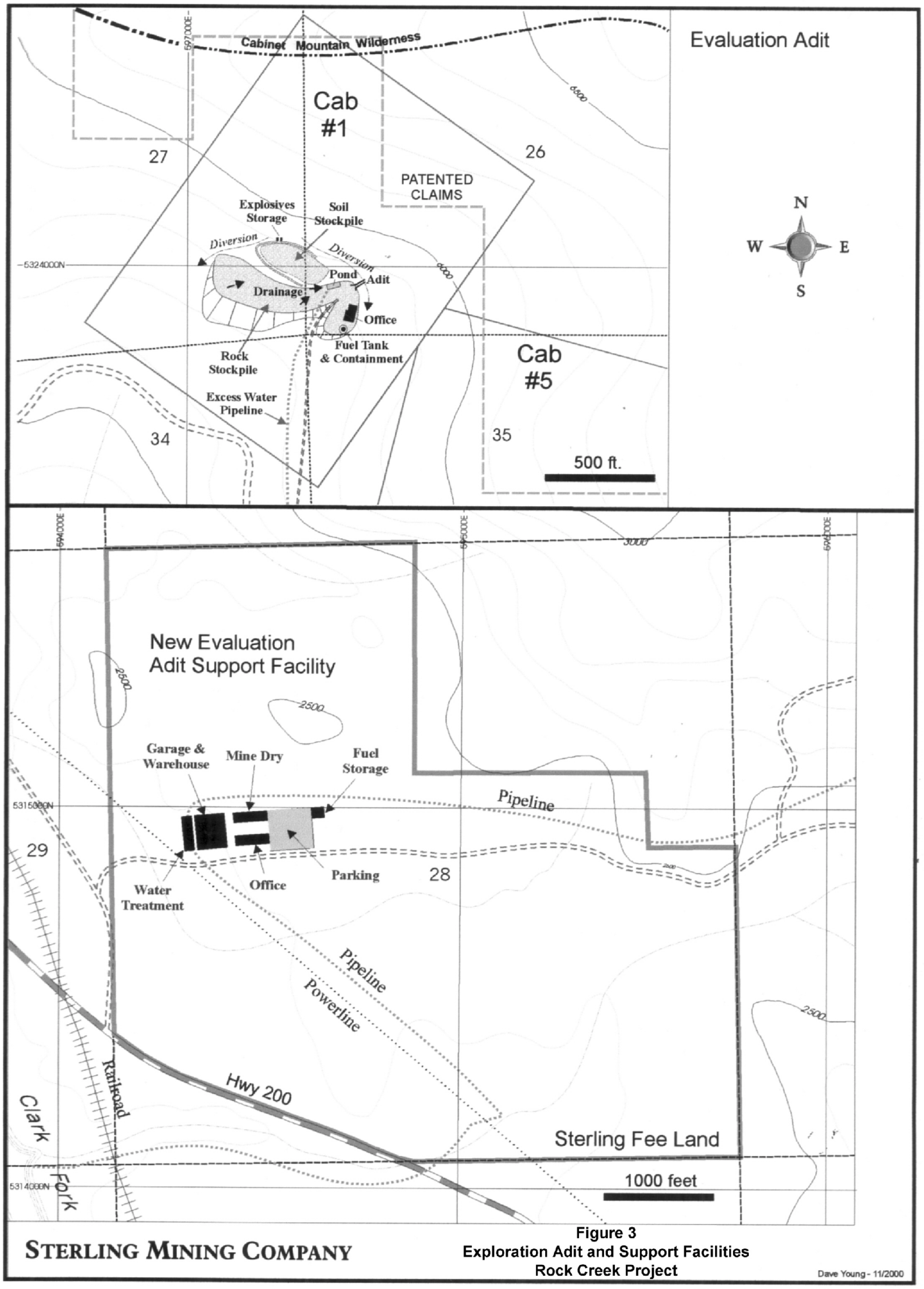
The portal of the evaluation adit would be located at about 5,755 feet elevation. About 59,000 tons of waste rock and 119,000 tons of ore would be excavated from the proposed adit (18 feet high by 18 feet wide with an estimated length of 6,592 feet at a decline of 10 percent). Unmineralized or barren waste rock would be end-dumped near the portal to form a flat-topped pile sloping downhill to its angle of repose. Mineralized material would be placed in a stockpile near the portal for later processing when the mill was in operation.

Several facilities are proposed to be constructed for the evaluation adit (see Figure 3). A few of these facilities would be located at the evaluation adit portal site. A 40-foot by 80-foot temporary steel shop building on a concrete slab would be constructed on top of the initial waste material removed from the adit. This building would provide warehouse space, indoor work space, a lunchroom, and lavatories. Two propane-fired generators (545 kW and 735 kW) would be located in a lean-to attached to this building to provide power during adit construction. An above-ground propane tank would be located near the shop building at the adit site. All exterior lights would be shielded or baffled from viewpoints in the Clark Fork Valley. Upon completion of the evaluation adit, all facilities would be either removed from the permit area or moved to the mill site for use during mining.

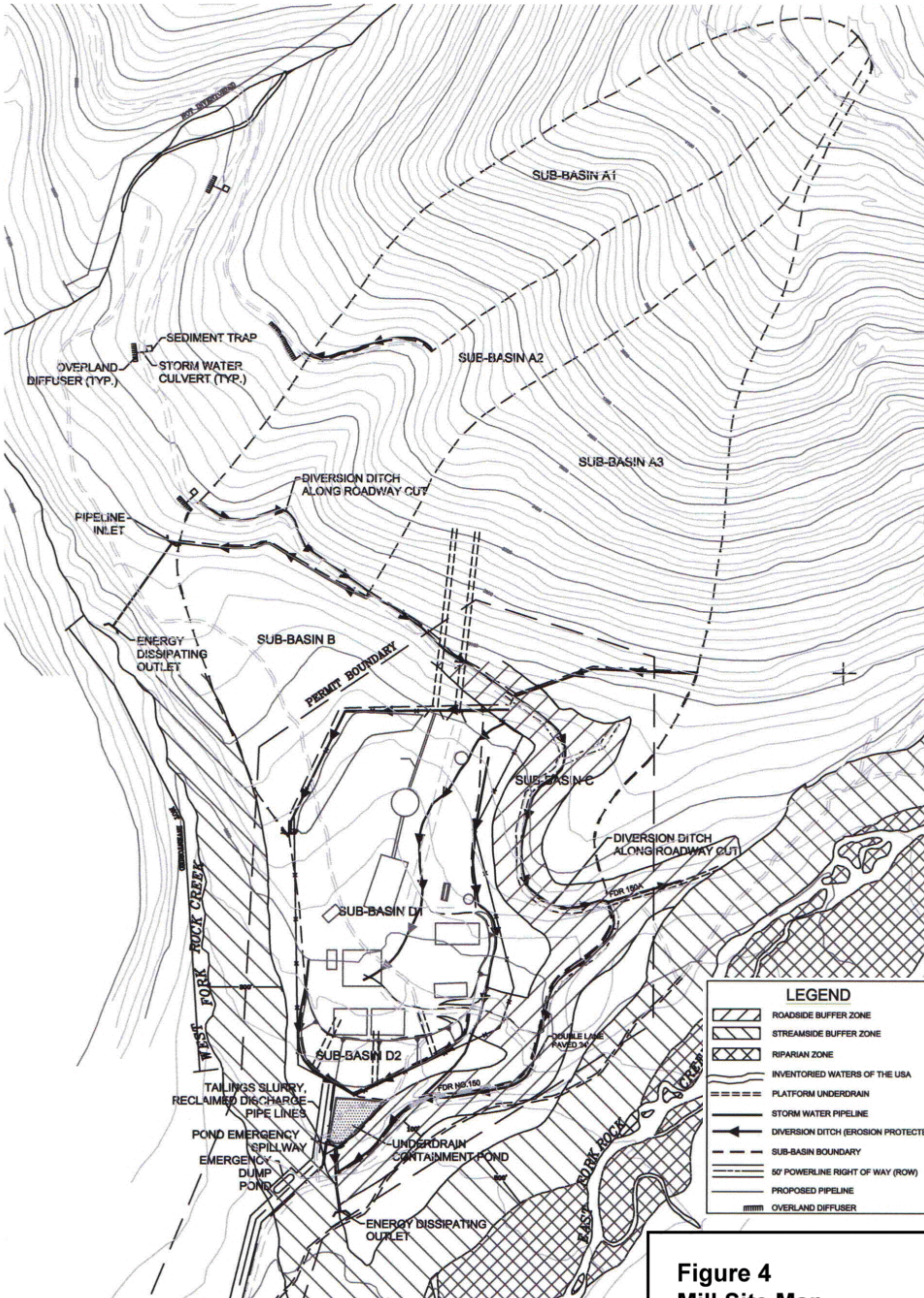
Additional support facilities would be located within paste facility footprint (see Figures 2 and 3). These include: an office situated in a 12-foot by 60-foot trailer or other similar structure; a changehouse/dry set up in another trailer; a garage and warehouse located in a pre-engineered steel building on a concrete slab; a graded, graveled employee parking lot, and a soil stockpile. A 500-gallon above-ground gasoline storage tank in a lined containment structure would be located near the garage and warehouse. The support facilities site would be supplied with electrical power from a local distribution line.

Excess water from the evaluation adit and storm water containment pond overflow would be pumped through a temporary 6-inch polyethylene pipeline to a temporary waste water treatment system at the lower support facilities site prior to discharge. This system would consist of a portable reverse osmosis unit and a pilot anoxic biotreatment system. (See the Water Use and Management section below for more detail on these systems.) Discharges must comply with MPDES limits. Sterling would install the portion of temporary mine water discharge pipeline between the evaluation adit and the support facilities site with a cable and winch instead of dragging it through the woods with a tractor. This would minimize vegetation clearing and erosion on the steep hillside below the evaluation adit. This pipe would be removed in a similar fashion when the mine reached the evaluation adit; the evaluation adit water would then be routed through the mine water drainage and collection system.

Extensive data collection, sampling and monitoring would be required during the construction of the evaluation adit. Rock geochemical characterization, monitoring and mitigations are discussed briefly in the Acid Rock Drainage and Metals Leaching Plan in the Monitoring and Mitigation Plans section of the alternative description in this document and in Appendix K of the final EIS. This plan includes provisions for waste rock handling during adit construction as well as contingency needs should premature project closure occur before mine construction and development begins. Under the Water Resources Monitoring Plan in Appendix K additional monitoring data would be collected from all approved surface and ground water monitoring locations and evaluated using the parameters in the proposed MPDES permit in Appendix D. An additional springs and seeps survey would be conducted and all existing water rights would be verified and wells or springs sampled during evaluation adit construction. The evaluation adit data collected and evaluated through this plan and rock mechanics and hydrological data collected through the Evaluation Adit Data Evaluation Plan (EADEP) would be used to modify mine designs and operations to keep impacts at or below the levels disclosed in Chapter 4 of the final EIS.



Evaluation Adit
Cabinet Mountain Wilderness
Cab #1
27
26
PATENTED CLAIMS
Explosives Storage
Soil Stockpile
Diversion
Diversion
Pond
Adit
Drainage
Office
Fuel Tank & Containment
Rock Stockpile
Excess Water Pipeline
Cab #5
34
35
500 ft.
N
W
E
S
New Evaluation Adit Support Facility
2500
Garage & Warehouse
Mine Dry
Fuel Storage
Pipeline
29
Water Treatment
Office
Parking
28
Pipeline
Powerline
Railroad
Hwy 200
Clark Fork
Sterling Fee Land
1000 feet
STERLING MINING COMPANY
Figure 3
Exploration Adit and Support Facilities
Rock Creek Project
Dave Young - 11/2000



SCALE: 1" = 700' approx.

Figure 4
Mill Site Map
Rock Creek Project

Mine and Mill Operations

The entire mill complex, including the mine portals, surface conveyor, SAG mill, office building, shop, sewage treatment plant and warehouse, would be located at the confluence of the east and west forks of Rock Creek. This alternative mine/mill site, as shown on Figure 4, would be located above the 10-foot flood stage (about 100-year flood event) with a minimum 300-foot buffer between the mill site and the east and west forks of Rock Creek to create a riparian buffer zone. It would be sited on cut-and-fill pads located at the toe of the southwest facing ridge at the confluence. The layout would afford a reasonably compact mill site arrangement.

Mill Site and Mine Adit Construction. The portal location would be placed at elevation 3,040 feet and would be within the mill site (see Figure 4). Each of the access adits would be about 15,530 feet long and about 1 million tons of waste rock would be produced during their construction. The 1 million tons of waste rock would be used in part to construct the mill site pad, potentially raising the ground level at the mill site by a maximum of 50 feet. This elevated pad would increase mill site visibility from surrounding Forest Service roads and wilderness viewpoints that are located above the mill site. A maximum pad height of 50 feet and retention of a minimum 100-foot vegetative buffer around the pad would help limit mill site visibility from the portion of FDR No. 150 that surrounds the site. Additional rock excavated from the adits beyond that needed to construct the pad would be used for foundation material at the tailings paste facility. Hauling of waste rock from the adits to the tailings paste facility site would only occur between August 1 and March 31 as mitigation to impacts on harlequin ducks. There would be no separate waste rock dumps under this alternative. Cover grouting prior to blasting would be used as needed during adit construction to minimize seepage into the adits during construction and mine operation.

Mill Site Mitigations. Aesthetic impacts of the mill and mine-related facilities would be minimized because Sterling would be required to implement the following mitigations:

- plant or retain a vegetative buffer of sufficient width between FDR No. 150 and mill site (minimum 100-foot buffer), the waste water treatment facility, and the substation in the lower Rock Creek drainage for visual screening;
- treat and/or paint permanent (life-of-mine) structures within the project area to visually blend with the surrounding landscape;
- shield or baffle exterior lights from viewpoints in the Clark Fork Valley;
- operate all surface and mill equipment so that sound levels do not exceed 55 dBA measured 250 feet from the mill;
- replace above-ground vehicle back-up beepers with discriminating back-up alarms that sense movement behind a vehicle if allowed by OSHA.

Mine Ventilation and Wilderness Air-Intake Adit. Electric ventilation fans would initially use the conveyor adit for intake and the service adit for exhaust. However, Sterling would use the evaluation adit for air exhaust ventilation during the operation phase once the mine intercepted the evaluation adit and might possibly require a separate air-intake ventilation adit in the wilderness towards the end of mine life. Intake and exhaust ventilation fans in the evaluation and mine adits would be adjusted so that they generate less than 82 dBA measured 50 feet downwind from the portals.

If in the future, monitoring showed a need to provide additional ventilation for mine personnel health and safety as required by the Mine Safety and Health Administration (MSHA) rules and regulations, it may be necessary to drive an adit to the surface in the wilderness to provide an additional air intake and a secondary escapeway from the mine about year 20 of mine operation. The air-intake ventilation adit would be driven from the underground workings; there would be no need for the creation of a waste rock dump at the adit portal in the wilderness. Fans would be located no closer than 200 feet underground from the wilderness adit opening. A process would be developed to ensure locating an air-intake ventilation adit in the CMW would be the last choice among potential ventilation options. Other options could include an upgrade of the existing ventilation system and closure of portions of the exhausted underground workings. If Sterling and the agencies determine that other methods of expanding ventilation capacities are reasonable Sterling would implement other ventilation techniques prior to being permitted to construct the wilderness adit/portal. If it was deemed necessary to construct the air-intake ventilation adit in the CMW, Sterling would conduct a detailed study verified by a site visit with the agencies prior to excavation to evaluate variations in topography and rock formations. Other site-selection criteria would consider possible post-closure use of the adit for bat habitat. The agencies would evaluate the compatibility of this post-mine use with restoration of premining appearance and configuration to address visual impacts. For purposes of analysis in this EIS, the agencies have assumed that the air-intake ventilation adit would be located about 400 feet north of the west ridge of Saint Paul Peak and would disturb about 800 square feet. The wilderness air-intake ventilation adit would be located so as to minimize visual impacts and reduce noise impacts to 45 dBA (measured 50 feet from the ventilation portal). If necessary to achieve this level, specially designed low-noise fan blades or active noise-suppression equipment would be used. Sterling would contact the Forest Service prior to construction for approval of final siting and construction methods.

Mine Plan. The room-and-pillar system of mining is used for most flat-lying or nearly flat-lying ore deposits where the ground is hard and firm, and where artificial means of support would be too costly. Room-and-pillar is one of four common types of open stope (underground excavation) methods. In room-and-pillar mining, some ore is left unmined to give support to the mine roof. The slot-pillar system is similar to room-and-pillar. Rather than a regular pattern of rooms and square pillars, a slot pillar is longer in one direction, creating a system of rectangular pillars and rooms. This design is used when more ground support is needed. Sterling proposes to use a combination of room-and-pillar and slot-pillar designs[1]. The majority of the mine layout would use a regular pattern of rooms and pillars. A design layout similar to the Troy Mine is proposed. The determination of when to use a regular pattern versus a slot pillar approach would be made after examining local ground conditions and rock mechanics data.

Sterling would be required to provide an updated preliminary mine design for agency review and approval prior to evaluation adit construction and mine start-up. The agencies would conduct a second review of the mine design to determine its suitability for actual conditions during mine adit construction. Specifics of this review would focus on general design approach, design criteria and methodology, rock mechanics test data from the Rock Creek deposit,[2] proposed room-and-pillar sizing and layout, identification of zones of rock instability and potential subsidence, and mitigations for these areas. Given the expected changes in planning any underground mine development, Sterling would submit updated detailed mine plans for agency review prior to entering areas where mining could have deleterious environmental impacts if adequate precautions were not taken. This would ensure development was meeting the environmental objectives and intentions of the original design. Approval of the mine plan would be contingent on demonstrating that the risk to Copper and Cliff lakes and the potential for subsidence would be minimized, based on hydrogeologic and applicable engineering analyses. Secondary pillar recovery would not be allowed.

The average depth of the ore body is 900 feet below the surface except where the ore approaches the outcrop interfaces. In order to protect against surface subsidence, Sterling proposes to leave a minimum of 100 feet of overburden between the mine workings and ore outcrop interfaces located in the north east and south east portions of the orebody. This limit would be modified based on site-specific rock mechanics information gathered as a result of the ongoing mining operation and the required Rock Mechanics Monitoring Plan.

---

[1] The pillars would be 45 feet square and drives and cross-cuts 45 feet wide. Ore recovery is projected at 65-75 percent. As ore thickness increased and/or overburden decreased more ground support may be necessary. Again, using a design from the Troy Mine, Sterling proposes to use a slot-pillar approach. The pillars would be 30 feet wide while the drives would be 50 feet wide. The overall length of the slot pillar would vary but could be on the order of several hundred feet long. Ore recovered using this approach is reduced (10 percent at Troy Mine), however ground support is improved.

[2] Rock mechanics data would initially be obtained during construction of the evaluation adit as outlined in the Rock Mechanics Monitoring Plan and the Evaluation Adit Data Evaluation plan described briefly in this document and in more detail in Appendix K of the final EIS.

In the Copper Lake Fault area where ore thicknesses exceed 100 feet, Sterling proposes to leave a large barrier pillar between the fault zone and the active mine area. The function of the barrier pillar would be to provide stability in this area of large ore horizon thickness and potential poor ground conditions. The dimensions and location of the barrier pillar(s) would be determined after assessing local ground conditions.

In areas where the proposed ore extraction thickness exceeded the capacity of designed vertical pillars, Sterling proposes to use a horizontal pillar to facilitate extraction over the entire ore height. A horizontal pillar is a section of unmined material left in place between two rooms stacked one on top of another. Using a design from the Troy Mine, Sterling expects to use this approach when ore thicknesses exceed 75 feet[3].

Conventional drilling, blasting, rock bolting, and mucking methods would be used underground. Broken ore would be processed by an underground crusher and then transported to the surface via conveyor belt for further processing. A surface conveyor belt would transport ore from the adit portal to the mill. A maximum of 2,500 cubic yards of ore mined during the construction period would be stockpiled at the mill site for processing following construction of mill facilities. Waste rock generated underground during the production period would be stored in mined-out areas.

Seasonal storage of mine water within underground mine workings is proposed to regulate outflow through the water treatment system. The area and volume required for storage would be increased throughout the mine life on an as-needed basis. By year 27, a 207.7-million-gallon reservoir would be established in worked out portions of the mine to handle maximum water storage requirements. This would equate to a maximum storage capacity of about 64 acres with water 10 feet deep. Barrier pillars would be left in place along either side of the storage area.

Rock geochemical characterization, monitoring and mitigations, for determining suitability of waste rock to be used for mill pad construction, road gravel, and paste facility toe buttresses and finger drains, are discussed in the Acid Rock Drainage and Metals Leaching Plan. This plan includes provisions for waste rock handling during operation as well as contingency needs should premature project closure occur. The evaluation adit geochemical data collected and evaluated through this plan and rock mechanics and hydrological data collected through the EADEP would be used to modify mine designs and operations to keep impacts at or below the levels disclosed in Chapter 4 of the final EIS. If that cannot be achieved, then the modifications would be subject to the appropriate level of MEPA/NEPA analysis and public review and comment. The facilities, designs and plans must be approved prior to mine construction and operation.

Reduced-emission diesel engines would be used in place of standard diesel engines underground. Electric underground ore trucks also would be used. These modifications would reduce concentrations of noxious gases released to the atmosphere and underground workings.

Ore Processing and Transport. Ore would be initially processed in an underground crusher and transported to the surface via a conveyor belt. A semi-autogeneous (SAG) mill, a fully wet milling facility, would further crush and grind the ore to liberate metal-bearing sulfides. The sulfides would then be removed by flotation processing in the mill. A number of chemicals are used in ore processing and transport[4]. The sulfide or ore concentrate would be sent from the mill to the Miller Gulch rail loadout facility as a slurry in a 3-inch HDPE-lined steel pipe with leak detection sensors and buried in the same corridor as the tailings and water pipelines. The rail-loadout process including concentrate dewatering, drying, and storage and railcar loading would take place within an enclosed building. Covered railcars would eliminate the use of a tackifier that would have been needed to minimize

[3] Vertical pillars would be 30 feet wide, rooms 50 feet wide, and the horizontal pillar 40 feet thick. In this manner a 200-foot thick ore horizon could be mined with two 80-foot-tall rooms with the intervening 40-foot horizontal pillar.

[4] A variety of reagents would be used in ore processing. These would include Xanthate, Yarmor-F Pine Oil, Dow 250, Superfloc S-5595, and Orzana A. Appendix I of the final EIS lists the reagents, physical characteristics and toxicity of each reagent, the addition points in ore processing, and the estimated annual consumption.

dust generation during transport to the smelter. Approximately 13 railcars of concentrate per week would be removed from the site. Reclaimed concentrate water would be piped to the tailings paste plant and then to the mill for reuse.

Ore Production Schedule

Sterling would develop an underground mine that would produce 10,000 tons of ore per day, or 3.5 million tons per year. Ore reserves are estimated to range between 136 and 144 million tons averaging 1.65 troy ounces per ton of silver and 0.68 percent copper. About 65 percent of the ore body would likely be mined, with about 35 percent remaining as pillars and other structural support. Actual underground conditions would govern the amount of ore removed.

Based on these figures, Sterling would mine and mill between 88 million tons and 108 million tons of ore giving the mine an anticipated production life of 25 to 30 years and a total project life of 33 to 37 years depending upon the actual amount of ore reserves and the ore extraction rate (see Table 2). Based on milling efficiencies at the Troy Mine, Sterling anticipates a milling efficiency of 85 percent. That is, about 85 percent of the copper minerals and silver in the mined ore would report to the concentrate, while 15 percent would remain in the tailings.

TABLE 2. Estimated Project Development Schedule - Alternative V

Number of Years	Project Development Stage
1	Evaluation Adit
2 [1]	Mine Development
1.5 [1,2]	Mine Development/Surface Facilities Construction
0.5	Start-up/Limited Production
26-30	Production[3]
2	Reclamation
33 - 37	Total Project Life

Notes:
1 Waste rock would be hauled seasonally during mine development (years 2 through 6).
2 Includes construction of mill site, waste water treatment plant, utilities corridor and paste plant.
3 The more conservative ore extraction rate of 65% would shorten production by approximately 3 to 4 years.

Employment

Development of the evaluation adit would take about a year. Work would start with 23 employees in the first quarter and increase to a maximum of 73 workers in the fourth quarter. Mine construction might immediately follow the adit work, or there could be a period of inactivity lasting months or even years between the two phases.

Actual mine construction would begin with 18 months during which the entire workforce would consist of 73 Sterling employees, then 275 contract construction personnel would be brought onto the project for 18 months. Employment of Sterling and contract workers would peak at a total of 348 during mine construction, with the minimum employment of 180 mine workers following this peak at about year 4 of construction. Sterling would have no direct control over contract labor schedules. It is expected that the contractor would use a 7-day work week with more than one shift per day.

As contract construction ended, the Sterling workforce would be expanded to 180 workers, from where it would continue to increase to 340 permanent full time workers nearly 2 years later as the mine reached full production. The project would operate 24 hours per day, 7 days a week, 354 days a year. It would have an expected operating life of up to 30 years. At the end of production there would be a 2-year shutdown and reclamation period employing 35 workers. Because the available labor force initially would not have all the skills needed to develop and operate the mine, Sterling proposes to conduct an intensive training program.

Paste Deposition of Tailings

Facility Design. The conceptual tailings paste facility design has undergone an engineering review for feasibility and stability (Klohn-Crippen 1999). The tailings paste facility design would be finalized as additional site information was obtained from the final design investigation process. Technical review of the final design would be made by a technical review panel established by the agencies. Review would encompass the technical aspects of design including the short- and long-term stability of the tailings storage facility. If supplemental rock and tailings characterization data and geochemical testing showed a potential for acid generation not presently anticipated, the review also would include consideration of some form of a seepage-inhibiting layer or liner beneath the impoundment. The technical review panel would assist in the development of the QA/QC protocols. The panel would ensure that any environmental impacts associated with final design remained within the scope of those impacts identified in the final EIS. If the final design generated additional impacts and they could not be mitigated to remain within this scope, then further MEPA/NEPA documentation would be required. The agencies would have to review and approve the final design prior to construction.

Tailings Transport. Tailings would be transported 4.1 miles from the mill to the paste plant as a slurry (30 percent tailings, 70 percent water) in a 16- to 24-inch, urethane-lined, steel pipeline (a double-walled pipeline) with leakage detection devices.

Tailings Paste Production. In general, the tailings would be delivered to the paste plant and dewatered to make a paste with a known proportion of water (approximately 20 percent by weight). The paste would be transported to the paste facility site and excess water routed back to the mill or the water treatment plant.

The paste plant building, approximately 80-feet by 80-feet by 110-feet high, would be located on the hillside adjacent to the tailings paste facility site. The building would be built into the hillside and painted to help reduce its visual impact. Trees and vegetation surrounding the paste plant would be retained or planted to help visually blend the plant site with adjacent hillsides. Sterling would conduct a site study verified by a visit with the agencies prior to final siting of the plant and access road to select a location that would reduce plant visibility and avoid harlequin duck habitat to the extent possible.

The paste plant would be designed to receive, dewater, mix, and pump 10,000 tons of tailings per day, 365 days per year. The tailings would be discharged from each tank at a rate of 67 tph. Maximum discharge rate could reach 90 tph to allow for maintenance of one tank while continuing paste production in the other three tanks. The surge capacity of the dewatering tanks and the coarse tailings agitated storage tank would allow the paste production system to be shut down for 7 hours without stopping the tailings slurry feed from the mill or before using a tailings slurry feed containment site adjacent to the plant. In addition, each mixer has a surge capacity of 15 tons or approximately 10 minutes of down time for one mixer/pump pair without shutting down the paste production process.

A 7-acre contingency tailings slurry feed containment site would be placed near the paste production plant to contain approximately 6 days of tailings production should the paste production plant be totally disabled or in the event of a major failure beyond the control of the plant design. This facility would be designed using traditional slurry impoundment design methods with a dam or embankment and would be lined with low permeability native materials (clay-type soils) and a synthetic liner to control seepage. The tailings stored in the containment pond would be dredged from the pond and reintroduced into the plant for deposition as a paste after the plant resumed operation. A paste plant shutdown of more than 6 days would result in the suspension of milling.

Process water for paste production would come from the water discharged from the paste dewatering tanks. Process water would be stored in a 30,000-gallon tank; excess water would be pumped back to the mill for reuse or discharged from the mill to the waste water treatment facility for disposal.

Tailings Paste Deposition. The location of the paste plant was selected to utilize a hillside location adjacent to the paste facility for convenient tailings materials handling and disposal. The paste plant design provides operational flexibility and avoids duplication in pump transport. Positive displacement pumps with a combined design capacity of approximately 680 dry tph would be used in an arrangement that would allow one pump to be shut down for either preventative or unscheduled maintenance. The paste would be pumped through a high-pressure pipeline to the paste delivery system at the tailings paste facility.

Land would be cleared and topsoil salvaged in advance of paste deposition (see Reclamation for more detail). While a tailings impoundment would require the entire footprint of the impoundment to be cleared or disturbed prior to construction of the impoundment, the paste deposit alternative restricts disturbance to the active areas. Initially the land clearing and soil salvaging would encompass the area where the key buttresses would be constructed and where the first few of rows of paste would be placed. Clearing would continue in advance of tailings placement, but Sterling would keep ground disturbance to a minimum (see Table 3 below). The tailings paste would be applied to the ground surface after sediment and erosion control features were in place and soil had been salvaged, and the foundation had been prepared. If suitable, clay material excavated within the proposed tailings paste facility footprint would be used to seal (line) the colluvium (soil deposited by gravity) at the north end of the proposed tailings facility, and other areas of the paste facility footprint that are underlain by materials of higher permeability. Clay also could be stored, if necessary, based on acid-base accounting during evaluation adit construction, for use at a later date to help reclaim waste rock piles.

TABLE 3. Summary of Estimated Active Versus Reclaimed Areas Over Time

for Alternative Paste Facility Construction Scenarios

Year	Area of Active Disturbance	Area at Final Grade (reclaimable area)	Total Area	Comments
BOTTOM-UP CONSTRUCTION SEQUENCE				
YR 0	0 acres	0 acres	0 acres	
YR 7	78 acres	0 acres	78 acres	Southern face under construction
YR 19	190 acres	0 acres	190 acres	Southern face completed
YR 21	97 acres	115 acres	212 acres	25% of top completed to final elevation
YR 31	74 acres	190 acres	264 acres	50% of top completed to final elevation
YR 33	41 acres	250 acres	291 acres	75% of top completed to final elevation
YR 34	0 acres	305 acres	305 acres	100% of top completed to final elevation

Source: Hydrometrics 1997

Note: Disturbed acreages do not include soil stripping in advance of paste deposition. If soil is removed for a distance of 500 feet in advance of paste deposition, an additional 30 acres of disturbance can be assumed.

A series of toe buttresses would be required to assist in containing the paste on the downslope sides, improving slope stability, and retaining sediment eroding off the slopes. Under these conceptual designs, the buttresses would reach an ultimate height of approximately 80 feet (elevation of 2440 feet), but the actual height would depend upon engineering behavior of foundation soils to be analyzed in more detail in the final design. The toe buttresses would be located in approximately the same location as the starter-dams for the tailings impoundment designs in Alternatives II through IV. The buttresses would be built during initial stages of mine development as rock was salvaged from within the proposed paste deposit footprint or became available during adit construction. The buttresses would consist predominantly of rockfill totaling approximately 1,360,000 cubic yards. The rockfill could be obtained from rock outcrops within the deposit site, borrow areas within the deposit site, and waste rock produced from mine adit development. Waste rock from the adits would be hauled to the tailings paste facility site and used immediately for buttress construction to avoid rehandling this material or the need for a waste rock dump at the mill site. The waste rock could only be hauled between August 1st and March 31 to minimize impacts to harlequin ducks. Only waste rock that had been determined to be non-acid producing would be used in the buttresses.

The Bottom-Up option selected in the preferred alternative would involve spigotting paste from the lower elevations and moving the spigot point upslope. The paste pipeline and spigot would be initially located on the crest of the toe buttress for the Bottom-Up option. Once a layer or a lift of paste had been completed, the pipes, and spigot would be relocated further down the row onto the oldest portion of the previous paste layer, or to a new row if the previous one had been completed. A new layer of paste would then be spigotted onto the previous layer(s) until final grade was achieved. The lifts would be approximately 1 foot until actual field construction experience indicated that a thicker lift could be deposited to ensure paste facility stability.

In the Bottom-Up option, a structural zone of compacted paste would be constructed upslope of the toe buttresses to permit the construction of a maximum 3:1 slope. The paste would be spigotted behind the structural zone at its angle of repose. The outer slope of the structural zone would crest at an elevation of approximately 2680 feet (320 feet high) using a 3:1 slope under the original conceptual design for the Bottom Up construction method. However, the design of the paste facility would be modified under the preferred alternative to construct the outer slope at the angle of repose (approximately 5:1), resulting in longer overall side slopes to help mitigate visual impacts. This would result in a crest of approximately 2740 feet (380 feet high); although the crest is slightly higher it would be positioned farther away from the highway and the remaining mass of the tailings facility would be deposited closer to Government Mountain and away from Montana Highway 200. Topographic relief of the upper surface of the paste facility constructed by any of the options could be created by preferential spigotting of the paste and the paste also could be reshaped by dozer to achieve the final grading prior to reclamation. The outer slopes would be manipulated during construction to create some slope variations per the final grading plan. The paste material would be reclaimed on the surface and outer edges whenever final grade was achieved (see Reclamation).

A system of basin drains would be incorporated to maximize recovery of seepage of residual process water in the paste and storm water infiltration through the paste. A blanket drain adjacent to the outer slopes and beneath the compacted structural zone would be constructed to maintain a drainage of the structural zone under the Bottom-Up option. An extensive system of finger drains also would be constructed beneath the paste facility. Conceptually these drains would consist of 4-inch diameter, slotted pipe surrounded by a zone of crushed rock 10 feet wide and 2 feet thick. The actual location of these finger drains would be determined during the final design. The water collected by the finger drains would be routed to a single collection pond located outside the main buttresses, pumped back to the paste plant, and, if not needed for paste production, returned to the mill for reuse or to the waste water treatment plant for discharge to the river. Seepage water collected in the paste facility underdrain after mine shutdown would be routed to the water treatment facility for treatment. This procedure would continue until such time that the quality of seepage water would allow direct discharge to ground water without treatment.

Additional ground water quality sampling would be conducted at specified monitoring wells prior to construction of the proposed tailings facility to document water quality conditions in the tailings facility footprint downgradient of the decommissioned Noxon sanitary landfill. Samples would be analyzed for physical parameters, nutrients, common ions, metals, volatile organic compounds and semi-volatile organic compounds. If the results of sampling indicate the landfill is a potential source area for contamination, appropriate steps would be taken to mitigate the potential for additional problems in the future. Mitigative measures could include, but not be limited to covering the landfill area with an impermeable synthetic material to reduce commingling of tailings leachate with landfilled materials.

Storm Water Control

All storm water detention and retention ponds would be lined with 30-mil HDPE (high density polyethylene) liners for primary seepage containment. The mill pad underdrains would provide secondary collection for the mill site. Underdrains or blanket drains according to final design specifications would provide secondary collection of storm water seepage through the tailings paste facility.

The lined storm water pond at the mill would be designed along with all diversions to handle a 100-year/24-hour storm event. Storm water at the adit portal and mill site would be collected and recycled to the mill for reuse. Water collected from the outer slopes of the mill pad and the mill site underdrains would only be allowed to discharge under conditions specified in the revised MPDES permit (see Appendix D in the final EIS). Otherwise water from the underdrain containment pond would be pumped back to the mill for reuse or to the water treatment plant for discharge. Storm water diverted from undisturbed lands above and adjacent to the mill would be discharged through overland flow diffusers or energy dissipating outlets outside the 300-foot streamside-buffer zone.

Since the tailings paste facility and the undisturbed portion of the disposal site would not retain storm water like an impoundment, one or two lined storm water ponds would be constructed at the lower elevations in the tailings disposal site (see Figure 2). These ponds would be removed and reclaimed after the tailings facility was completed and reclaimed. These ponds also would be sized to handle the runoff from the active portion of the tailings paste facility site during an 100-year/24-hour storm event. Water would only be allowed to discharge from these ponds under conditions specified in the revised MPDES permit (see Appendix D in the final EIS). Water collected in the storm water pond could be pumped to the paste plant and then to the mill as process water or to the waste water treatment plant for discharge to the river, or used for irrigating reclaimed portions of the tailings paste facility if water quality was acceptable.

Sediment and runoff control of the tailings facility would be handled in two methods. First, limiting unreclaimed areas to the active disposal areas would minimize sediment and runoff. Second, localized sediment retention structures and BMP=s would be used in the downslope perimeter of the active panels for control, sampling and recovery of drainage from the tailings paste facility, sediment, and storm water runoff. These structures and collection ditches would act as storm water diversions to channel the water and sediment from the active portion of the tailings paste facility into the tailings facility site storm water ponds. The ditches also would be sized to accommodate a 100-year/24-hour storm event.

Storm water from undisturbed lands above the tailings paste facility would be diverted around the active portions into the north fork of Miller Gulch and to Rock Creek during mine operations. Runoff from reclaimed and fully revegetated, stabilized portions of the tailings paste facility would be diverted to settling basins before mixing with runoff from undisturbed areas. Settling ponds for runoff from newly reclaimed areas along the perimeter of the tailings paste facility would be unlined and would discharge through a constructed drainage network to existing drainages. However, settling ponds on the upper portion of the paste facility would require lining to prevent excess infiltration of water. Storm water from reclaimed areas that were not fully stabilized would be captured along with runoff from the active areas of the tailings paste facility. Undisturbed portions of the paste facility would either drain into existing drainages or be diverted away from active areas, soil stockpiles, and the storm water pond(s). All these diversions would be sized to handle a 100-year/24-hour storm event. These diversions would be reclaimed and permanent drainage ways established when mine operations ended and the site was fully reclaimed.

The final design for the storm water and sediment control structures at the paste facility must be approved by the agencies prior to being constructed.

Water Use and Management

A detailed water balance would be refined annually for estimating water use, seepage, and discharges. Actual volumes for a number of water balance variables would be measured to update previously projected calculations. These would include measurements of precipitation; evaporation; mine and adit inflow, outflow, and storage; inflow to the tailings impoundment; seepage from the tailings impoundment; seepage collected by the perimeter recovery system; outflow to the passive biotreatment system; and discharge to the Clark Fork River.

Baseline data and the similarity of site conditions to the ASARCO Troy Mine site indicate that acid drainage is not expected. Additional data collected during evaluation adit construction, mine development, and operations would be required to refine predictions of the potential for long-term acid drainage, and to assess the acid drainage potential of waste rock prior to its use as construction material. A representative underground sampling and acid-base testing and monitoring program would be developed and implemented on rock from the adits, ore zones, above and below the ore zones, and in the barren zone as described in Appendix K. The results would help identify materials to be segregated to prevent production of acid leachate or drainage.

The agencies would require and bond for long-term monitoring and maintenance, and possible long term post-closure water treatment in order to ensure ground and surface waters would be protected from unanticipated impacts.

Evaluation Adit Construction Requirements. Water requirements for driving the evaluation adit would average 30 gallons per minute (gpm) during the drilling cycle. Additional water may be needed for dust control in the adit. A small amount of potable water also would be needed for the lavatory and lunchroom in the shop.

Water for drilling would initially be hauled to the site from a makeup water well at the confluence of Rock Creek and the Clark Fork River (see Figure 2). A lined pond, with a capacity of about 30,000 gallons, would be constructed near the evaluation adit portal to collect site runoff and store the hauled water. A barrier would be erected around the pond to exclude wildlife. A diversion berm would be constructed above the portal and soil stockpile to divert natural runoff around disturbed areas (see Figure 3).

A pump in this pond would provide water for drilling during the initial evaluation adit construction phase. Excess water encountered in the adit during this phase would be pumped to the pond. After the adit had advanced approximately 350 feet, an 18-foot by 18-foot by 40-foot (97,000-gallon) mine sump would be excavated to function as the evaluation adit water sump. An oil skimmer and pressure filter would be located at this sump to remove oils and grease and suspended solids from the water supply.

Excess water from the adit sump and pond overflow would be pumped through a temporary 6-inch polyethylene pipeline through a biotreatment system and an ion exchange treatment plant for treatment prior to discharge. This pipe would be removed when the mine reached the evaluation adit; then the evaluation adit water would be routed through the mine water drainage and collection system described below. Discharges must comply with the proposed MPDES limits. The evaluation adit is estimated to generate approximately 168 gpm once it was fully constructed.

Potable water would be trucked to the adit site and stored in a tank in the shop until a suitable source was found in the adit. Two wells would be installed to supply the support facility. Sewage from the adit shop and the office and the mine dry at the support facilities would drain to conventional septic tanks and drainfield systems. If, according to DEQ, either or both of the proposed sites or their alternate locations were not suitable for a drainfield, then a holding tank would be installed. This tank would be pumped periodically and hauled to a municipal sewage disposal facility (ASARCO Incorporated 1992).

Mine Operation Requirements. During full production, the mill would require 3,788 gpm of process water. Process water for the mill would come from five sources: reclaimed tailings slurry water, mine discharge water, reclaimed concentrate slurry water, mill site and tailings paste facility site storm water, and if needed, make-up-well water. Process water would remain in an essentially closed loop. Approximately 5 to 10 percent of the flow in the process loop will be diverted to the waste water treatment system and fresh water added to the circuit on an ongoing basis to prevent buildup of excess constituents in the process water. Because the amount of mine water discharge and available reclaim water from the tailings paste plant and the dewatering system at the rail loadout would vary seasonally, a make-up water well has been planned in the Clark Fork River alluvium capable of supplying full make-up water requirements. The location of this proposed well near the confluence of Rock Creek and the Clark Fork River is shown on Figure 2. A buried 12-inch steel pipeline would connect to the reclaim water line thus carrying water to the mill.

Mine inflow not used for mill makeup or stored in the mine would be routed to the water treatment facility prior to discharge in the Clark Fork River below Noxon Dam. The rate of mine inflow would vary throughout the mine=s life in proportion to the total volume of ore excavated. The rate of mine inflow routed to the water treatment facility also would vary throughout the year in response to climatic conditions, especially precipitation. Discharge flow is estimated at 550 gpm--year 1; 937.7 gpm--year 10; 1,342.7 gpm--year 20; and 2,043.1 gpm--year 30 or end of mine life.

By the end of mine operation, up to 207.7 million gallons of mine and adit water potentially would require storage in an underground reservoir. This reservoir could require a 64-acre pond 10 feet deep. Excess water would be held in or released from storage depending the ability of the waste water treatment systems to treat the volume of water to MPDES permit limits. For example, should a problem develop with the mine water treatment system, excess mine water could be stored in the mine for a short time until the problem with the water treatment system was corrected. During the wet season, excess mine water would likely be stored underground. During the dry season, stored water would be released and directed to the water treatment system.

Mine effluent typically would be expected to contain high concentrations of suspended solids at a relatively neutral pH and some dissolved metals similar to the Troy mine. This would contribute a significant portion of the total metals load to mine effluent. Initial removal of suspended solids would be accomplished using two 100,000-gallon mine sumps to settle out the solids, by adding chemicals to flocculate (clump) the particles if necessary, and subsequent filtration. Water would be pumped from the mining face to these sumps for the main mine water supply.

Segregation of water between active and inactive underground workings would be considered in the later stages of active mining. Such segregation could potentially reduce the volume of water requiring treatment prior to discharge. Segregation would be accomplished by separating ground water inflow from non-active mining areas and conveying this water in a separate pipeline to the water treatment facility. This water should be lower in suspended solids, heavy metals, ammonia and nitrate than water from the active mining area. This water may not require treatment prior to discharge or may only require partial treatment to meet discharge permit limits.

Water originating within the mill site also would be collected and routed to a drainage sump at the mill site for use as process water. Water filters and an oil skimmer would be located in the mill area to remove suspended solids and oil and grease from the water supply. Filter backwash would be sent with tailings to the tailings paste plant. Filtered water from mine and mill sumps in excess of the requirements for mine development and mill make-up water would flow through a buried pipeline to the water treatment facility before discharging to the Clark Fork River.

Reclaim water from the paste plant and the concentrate dewaterer at the rail loadout would either be returned to the mill for reuse as process water or to the waste water treatment facility for treatment prior to discharge to the Clark Fork River. This excess water would be discharged through a clarifier and sand filtration unit or other similar unit to remove suspended solids before being routed to the water treatment system for nitrate removal.

General Waste Water Treatment. Two waste water treatment systems designed primarily for nitrate removal would be installed: an anoxic (low oxygen content) semi-passive biotreatment system and a reverse osmosis treatment system. Neither system would be designated as the primary or back-up system. A portable version of the reverse osmosis system would be built to handle mine discharge water from the evaluation adit and placed at the support facilities site. This unit would be moved to the water treatment facility site if a decision was made to continue with the mining operation and the unit would be expanded to accommodate greater flows that would occur during mine construction and operation. It may take some time for the biological treatment system to become fully operational during mine start-up when variable flows and conditions would be expected; the reverse osmosis system would have the primary water treatment role during evaluation and mine start-up. Sterling expects that the biotreatment system would become the main treatment system; however, the reverse osmosis system would still be available to operate during bioreactor upsets or if higher treatment efficiencies were required. Also as noted, the quantity (flow rate) of excess mine water directed to the water treatment facility could be reduced during such situations by diverting excess mine water to the in-mine storage area.

At the final design stage, modifications to the treatment system may be made depending on a number of factors, including the actual discharge water characteristics, the final MPDES permit limits, and the technology available at the time. All modifications would still have to result in compliance with MPDES permit limits and not result in impacts significantly different from or greater than that identified in the final EIS. If any that did occur, then the modifications would be subject to the appropriate level of additional MEPA/NEPA analysis.

Mine water would flow through a pipeline to the water treatment facility. Sedimentation tanks (clarifiers) would remove a high percentage of suspended solids in the discharge water (at least 95 percent). The sludge from the clarifiers would be taken to the paste plant and incorporated into the tailings paste for deposition. Water leaving the clarifiers also would flow through sand filters for final suspended solids removal (80 percent of the remaining fraction). The partially treated water would then be directed to one or both of the water treatment systems depending on system capacity, amount of flow, and other variable conditions.

Anoxic Biotreatment System. The semi-passive biological system for treating mine water would consist of one or more anoxic biotreatment cells, containing gravel-packed, attached-growth denitrification reactors. An in-ground concrete biotreatment cell designed to treat 650 gpm would be 6 feet deep and 73 x 73 feet in area (5,330 ft^2). Four of these cells would be constructed to treat 2,300 gpm (maximum design flow). These cell dimensions are based on preliminary design data for 80 percent nitrate-nitrogen removal at 6°C. Additional cells could be added as needed.

The pretreated (clarified and filtered) water would flow through a trickling filter to convert the ammonia to nitrate (nitrification). The trickling filter may need to be enclosed or insulated to allow for proper functioning during colder seasons.

The biotreatment process would rely on methanol as the carbon source for the denitrification process. Methanol at a concentration of approximately 60 mg/L would be continually added to the influent water. Methanol concentrations would be monitored and adjusted as necessary to achieve optimal nitrogen removal. A 300-gallon tank (approximate volume) would be located adjacent to the biotreatment system building for initial use of the biotreatment process. A larger tank would be installed if biotreatment proves to be successful. Daily methanol consumption, if the biotreatment system became the primary waste water treatment system, would range from several gallons during initial startup to approximately 250 gallons during maximum discharge of 2,300 gpm. Phosphorus also may need to be added for microbial growth. It is estimated that approximately 1 milligram of phosphate (as phosphorus) would have to be added for every 30 milligrams of nitrate (as nitrogen) removed.

Mine water and methanol would enter the bottom of the biotreatment cell(s), and upwards flow through the cells would be controlled by a pump. The cell(s) would be filled with gravel and inoculated with several hundred gallons of sludge taken from the nitrogen-removal recycle loop at the Kalispell wastewater treatment plant. The cell(s) should not require reinoculation. The biotreatment cell(s) would not generate sludge or reject material requiring disposal. Nitrate would be converted to nitrogen gas (denitrification) and methanol to carbon dioxide; these nontoxic gaseous by-products would be vented to the atmosphere. Relatively small amounts of biomass may be generated which would discharge to the aeration pond where it would be broken down.

After biological treatment for nitrate removal, the effluent would flow to an aeration pond with a 12-hour minimum residence time prior to reaching the final monitoring point before discharging to the Clark Fork River. The aeration pond would be lined with 30 mil HDPE. The aeration pond would include a calm pre-discharge zone and a multi-level discharge structure to minimize suspended solids in the effluent. Excess methanol and biomass from the biological nitrate removal system would be reduced through aerobic biological action. Dissolved hydrogen sulfide, if present, also would be reduced through aeration. However, sludge containing small quantities of heavy metals may build up in the aeration pond over time. Sampling of this sludge would be required to determine the most appropriate method of site reclamation after the mine is shut down and mine wastewater treatment is no longer required (see Revegetation). At the full flow rate of 2,300 gpm near the end of mine life, the required ten-foot-deep pond would encompass approximately one-half acre. If the effluent did not meet discharge limits, it would be returned to the treatment facility for further treatment.

Reverse Osmosis Water Treatment. Reverse osmosis was selected for several reasons as the second water treatment system instead of ion exchange, which was proposed in the draft EIS. The reverse osmosis system is less complex, requires less operator attention, generates a smaller waste stream, and has no added chemicals. In addition, reverse osmosis technology has been proven to be capable of removing dissolved pollutants, such as nitrate, from water in many large capacity waste water treatment facilities throughout the world. Because the reject water or waste stream cannot be easily disposed of at the project site, the reverse osmosis system would operate at a high recovery rate to minimize the waste volume.

The reverse osmosis would most likely be the primary waste water treatment system used during evaluation adit construction and early stages of mine operation. When the biotreatment system became fully operational, the reverse osmosis systems would primarily be used during biotreatment system upsets or maintenance. It also may be used as a polishing step when the effluent did not meet standards. During such an event a portion of the biotreatment system effluent would be treated with reverse osmosis such that the recombined effluent from both systems met the limits of the MPDES permit. In the event that the biotreatment system failed or was unable to consistently meet the limits, it may be necessary for the reverse osmosis system or some other approved system to become the primary treatment system.

The reverse osmosis system would be housed in a building approximately 66 feet long, 28 feet wide, and 20 feet high. It would contain sufficient reverse osmosis units to treat flows up to 650 gpm, the maximum flow expected in year 5 of production and year 10 of project life. The modular nature of reverse osmosis would allow simple installation of additional reverse osmosis units if reverse osmosis were still required for the treatment of 100 percent of the mine discharge in later years of mine operation. These units are complete with high-pressure pumps, cartridge filters, membrane modules and all other necessary equipment. This operation would probably require one operator around-the clock initially and after operations had been finalized, only a day-shift operator. The clarifier and media filters would probably be located outside the reverse osmosis building.

Once the influent water had undergone pretreatment for removal of suspended solids, the reverse osmosis could run continuously and reduce dissolved ion concentrations, including nitrate, nitrite, ammonia, and metals, by more than 90 percent. Routine maintenance would include instrument calibration, chemical cleaning, and periodic membrane replacement. Membranes would require replacement every 3 to 5 years.

Only minimal quantities of brine (liquid waste from the reverse osmosis process containing elevated levels of nitrate, nitrite, ammonia, metals, and other ions) would be generated if the biotreatment becomes the primary treatment system with occasional use of the reverse osmosis. The waste brine that is generated, approximately 10 percent of system inflow when reverse osmosis treatment is required, would either be stored and gradually blended back into the biotreatment treatment system or crystallized/evaporated. The waste would not be classified as a hazardous waste as defined in 40 CFR 261.21-261.25. The brine or crystallized solid would not be ignitable, corrosive, or reactive and it would be non-toxic based on EPA=s Toxicity Characteristic Leaching Procedure (TCLP) criteria (Hydrometrics, 1997). Estimated concentrations of waste brine presume no nitrogen removal by biotreatment. Waste brine concentrations would decrease in direct proportion to nitrogen removal efficiencies in biotreatment.

The brine would be stored in 500,000 gallon, epoxy-coated, covered, vertical, bolted steel tanks (60 feet in diameter and 25 feet high). A single tank would provide 5 days of brine storage for the initial 650 gpm reverse osmosis facility. Three tanks would be required to hold approximately 5 days of brine storage for estimated maximum mine operation waste water flow of 2,300 gpm.

A crystallizer/evaporator would be installed on site to treat any reverse osmosis brine generated. The brine would be reduced to one 55-gallon drum of waste per day for every 250 gpm of water treated (one drum of crystallized solid waste per 360,000 gallons of water treated). This waste would either be stored in drums or in a tanker trailer based on the actual waste volume being produced. It is anticipated that over 99 percent of the heavy metals originally present in the mine wastewater would be removed by pretreatment through clarification and filtration prior to treatment in the reverse osmosis system so only one percent of the metals would remain in the crystallized brine. The end product would be a solid that could be disposed as a regulated waste in an approved landfill such as those in Missoula, Kalispell, and Spokane or used by fertilizer companies in western Montana, Idaho, eastern Washington, and Canada.

After excess water from the proposed project was treated by settling, filtration, and the waste water treatment systems, treated discharge would be piped to the Clark Fork River with a proposed outfall and engineered in-stream diffuser downstream from Noxon Reservoir. The purpose of the diffuser would be to distribute treated water though a perforated steel pipe to allow more mixing with river water. The in-stream diffuser also would reduce discharge velocities[5]. The diffuser would be located approximately 750 feet above the confluence of the river and Rock Creek and would run the entire width of the river. The diffuser would need to be in place prior to construction of the evaluation adit for discharge of water generated during that phase of the project. Prior to installation, a design study would be performed to reevaluate streamflow conditions and streambed characteristics at the selected outfall location. The diffuser design would be finalized after the study was complete, and an appropriate method of anchoring would be selected. If the diffuser was relocated from the proposed location, the agencies would need to determine how or if that affected the impact of the discharge to the river and if the MPDES permit limits needed to adjusted. If the changes are significant, then additional MEPA/NEPA analysis may be required.

A sewage treatment facility would be incorporated into the mill complex design. This package facility would contain the standard aeration tank with activated sludge, a settling tank with a sludge return to the aeration tank, and a chlorine contact chamber. Effluent from the contact chamber would be directed to the tailings disposal system, and sludge would be disposed of at an approved off-site facility.

Transportation

During construction of the evaluation adit, access to the evaluation adit site would be via existing FDR No. 150 and Chicago Peak Road, FDR No. 2741, and a short spur road. Improvements to existing FDR No. 2741 would include a minimum road width of 14 feet, improved or added road turnouts about every 1,000 to 1,500 feet, and a reconditioning of the road surface for year-round use and maintenance. Minor amounts of clearing may be necessary for turnouts and for snowplowing. The short spur road would need a 14-foot wide surface to accommodate equipment. This work would be done in consultation with the Forest Service. Employees would use the parking lot at Sterling's support facility along the existing FDR No. 150 (See figures 2 and 3) and would be transported in four-wheel-drive vans to the adit. This would limit mine-related traffic to the minimum number of vehicles needed to transport work crews and supplies to the adit.

Because of the year-long schedule for adit construction, it would be necessary to plow snow on FDR No. 2741 for one winter. Snowplowing for a portion of FDR No. 150 would occur over mine life. Snow removal and disposal would follow Forest Service guidelines.

Prior to mine construction, Sterling must submit a traffic management plan to reduce total average daily traffic (ADT) to the mill site and to mitigate impacts on harlequin duck as well as grizzly bears. This plan would

[5] The diffuser would be fixed at the bank on concrete thrust blocks and surrounded by cobble riprap to provide shoreline protection. It would lie in the river channel, perpendicular to the flow of the river. The perforations of the diffuser system would be designed to reduce the discharge velocity to less than 2 feet per second, and allow mixing to occur across a broad cross-sectional profile of the river.

address evaluation, construction,[6] and operation mine-related traffic (excluding public recreation, Forest Service, logging traffic and other private and public traffic). A travel lane would need to be maintained for traffic on FDR No. 150 during road construction and reconstruction. The traffic plan also would need to address the means to allow private landowners reasonable access to their property, and public access to NFS lands. In addition, emergency medical access to the mill and mine sites would need to be considered in the plan. The plan must include provisions for busing employees during mine construction and operation between the waste water treatment facility area and the mill and mine. Busing employees from this location would reduce the mine construction- and operation-related traffic to primarily supply vehicles, mine management vehicles, and two or three buses twice per shift including the administrative workers shift.

Mine construction workers would be bused from the support facilities site until FDR No. 150 had been relocated and the parking lot at the waste water treatment plant had been constructed. A parking lot capable of handling the parking needs of the largest shift plus visitors to the mine, estimated at 150 to 175 vehicles, would be necessary at the waste water treatment plant site. Busing would then continue from this site.

The intersection of FDR No. 150 and Montana Highway 200 would be relocated to meet applicable MDT siting requirements. This alternate route for FDR No. 150 would intersect Montana Highway 200 about 0.23 miles west of FDR No. 1022 (McKay Creek Road). This route would then proceed westerly and northerly over NFS lands and Sterling land and would connect to an old existing road in the vicinity of the waste water treatment plant if final siting proved the old road to be suitable. This modified alignment would take advantage of an existing road farther away from Rock Creek and reduces the amount of new construction. This existing road would be upgraded and paved and a new segment constructed to connect to existing FDR No. 150 approximately 0.25 miles above the confluence with Engle Creek. This alternate road would need to be constructed prior to closure of existing FDR No. 150 at the tailings facility site. FDR No. 150 below the mill would have minimum width shoulders to provide structural support to the driving lane. The shoulders would not be conducive to parking along road and no turnouts would be provided to minimize stopping along the road. Sterling would time its road closure schedule for FDR No. 150 to accommodate essential local access needs.

The relocated portions of FDR No. 150 and the parking lot at the proposed waste-water treatment facility site would be constructed during the first part of the development phase (year 2) to keep construction related-traffic away from Rock Creek, to provide a road capable of handling the expected mine construction-related and public levels of traffic, and to allow for busing of mine adit construction workers to the mill site and mine portal. Access to the evaluation adit support facilities, paste plant, and the tailings paste facility site from the mill would require mine vehicles to travel down FDR No. 150 to Montana Highway 200 and then northwest on the highway to Government Mountain Road and then southeast on FDR No. 150B.

All roads used during mine operation between the mill, the mine, the paste plant, the water treatment facility, the highway, and the rail loadout facility would be paved or graveled (see Table 4 below). FDR No. 150 above the mine and the Chicago Peak Road, FDR No. 2741, would not be paved. The service road, FDR No. 150B, around the outer edge of the tailings disposal site from the paste plant to Government Mountain Road would be paved; however, a short stretch of maintenance road along the west side of the disposal site would be graveled. FDR No. 150B from the paste plant to the junction with FDR No. 150 would be reconstructed as a gravel road and used only for pipeline maintenance after mine production begins. FDR No.150B would be gated at both ends and access would be restricted to mine-related traffic. A 10-foot wide gravel maintenance road would be constructed along the cross-country portion of the discharge water pipeline between the Clark Fork River and FDR No. 150. A small parking lot for 6-8 vehicles would be required at the paste plant for operators= and mine management vehicles and supply deliveries.

---

6 Mine-related construction traffic would be limited to 30 round trips per month on FDR No. 150B between April 1 and July 31 and unlimited traffic from August 1 to March 31.

One existing bridge on FDR No. 150 over Rock Creek near the mill site would be replaced. Bridges to be constructed or reconstructed over Engle and Rock creeks would be realigned nearly perpendicular to the stream. An extension to the culvert on the West Fork of Rock Creek above the last bridge on FDR No. 150 is proposed. The existing bridge over Rock Creek near the junction of FDR Nos. 150B and 150 would not be reconstructed because there would be no concentrate hauled from the mill to the rail loadout facility; however some repairs may be necessary to provide safe crossings for trucks hauling waste rock to the paste facility site during mine development. If this bridge deteriorated during mine operation and the Forest Service determined it was unsafe, it would be removed by Sterling. FDR No. 150 reconstruction in close proximity to Rock Creek and associated bridge construction and reconstruction below the proposed mill site would most likely be done during the last half of the year of evaluation adit construction but would only be done between August 1 and March 31 during periods of low flow and dry weather to minimize impacts to the stream and harlequin ducks.

Additional gravel roads or maintenance trails would be required to provide access to the utility corridor where it does not follow FDR No. 150. Sterling would be responsible for maintaining these mining-related roads and trails. Maintenance of FDR No. 150 would be Sterling=s responsibility, unless additional use by the Forest Service or other interests warranted a cost-share agreement. A portion of FDR No. 150B may be removed and reclaimed after the tailings paste facility has been reclaimed and the paste treatment plant decommissioned, removed, and reclaimed. The need for closure, reclamation, or modification of Forest System roads used by Sterling during mine operation to gravel or dirt roads would be determined by the KNF at mine closure. The post-mining treatment of roads would depend on forest land uses, needed road densities, and KNF=s ability to maintain paved roads versus gravel or dirt roads.

Utilities

Pipelines. A single utility corridor would be developed along FDR No. 150 and would include the proposed 230 kV transmission power line, a tailings slurry pipeline, ore concentrate pipeline, mine discharge pipeline, and return water pipeline. The pipelines would split into two corridors at the junction of FDR Nos. 150 and 150B. The tailings slurry pipeline and concentrate pipeline and a return water line would follow or parallel the FDR No.150B road alignment to the paste plant. The concentrate pipeline and return water line would continue along FDR No. 150B and a short stretch of the Government Mountain Road to the rail loadout facility. The mine water discharge line and a return reclaim water line would follow the new FDR No. 150 alignment to the waste water treatment plant and the discharge line would continue to the discharge outfall in the Clark Fork River and connect with the make-up water well located adjacent to the river. See Table 5 below for information on the size and types of pipe proposed for use. All pipelines would be buried at least 24 inches deep. Burying the pipelines would provide better protection from vandalism, eliminate the visible presence of the pipelines, and facilitate concurrent reclamation in the pipeline corridor along most of the route between the mill and the paste plant. The pipelines would be visible at the four above ground crossings of Rock Creek, West Fork of Rock Creek, and Engle Creek. All lines would be encased in a larger steel pipe at creek crossings adjacent to or near bridge crossings to guard against the unlikely event of a leak or rupture.

Table 4. Summary of Roads To Be Used Under Alternative V

Road	Section of Road	Type	Length	Width	Reconstruction	New Construction	A
FDR No.150	Hwy.. 200 to mill site	Paved	5.04 mi.	24 ft	3.42 miles	1.62 miles at beginning of FDR No. 150	C
FDR No.150	Mill site to FDR No.2741	Gravel	2.8 mi.	20 ft	minimal reconstruction as needed for 2.8 miles		C
FDR No.2741	FDR No.150 to evaluation adit portal spur road	Gravel	4.6 mi.	14 ft	minimal reconstruction as needed for 4.6 miles		C p p

Road	Section of Road	Type	Length	Width	Reconstruction	New Construction	Access
							Available during winter
FDR No.150B	FDR No.150B from Rock Creek crossing to paste plant road	Gravel	1.07 mi.	14 ft	1.07 miles		Locked gates, Sterling pipeline maintenance access only
FDR No.150B	Paste plant road to Government Mtn. Rd.	Paved with turnouts	1.6 mi.	14 ft		1.6 mi. around south end of tailings paste facility	Sterling and supply traffic only
FDR No.150	Government Mtn. Rd. From FDR No.150B to rail loadout facility	Gravel	0.25 mi.	24 ft		0.25 mi.	Open, county road
FDR No. 150-1022 Tye	Tye road between FDR No. 150 and FDR No. 1022	Gravel	0.23 mi.	14 ft.		0.23 mi. between roads	Open
Access Rd.	FDR No. 150 to mill site parking lot	Paved	0.04 mi.	24 ft.		0.04 mi. into mill site	Sterling, visitor, and supply traffic only
Access Rd.	North from 150B along west side of disposal site	Gravel	0.57 mi.	10 ft	0.57 miles	0.08 for slurry/reclaim line to water reclaim pump	Sterling maintenance only for seepage collection line access
Access Rd.	From Hwy. 200 to Clark Fork River	Gravel	0.75 mi.	10 ft	0.75 miles		Sterling pipeline maintenance only
Access Rd.	From FDR No. 2741 to evaluation adit portal	Gravel	0.18 mi.	14 ft.	0.18 miles		Sterling and supply traffic only
Access Rd.	FDR No.150B to paste plant	Paved	0.98 mi.	14 ft	0.76 miles	0.22 miles	Sterling and supply traffic only

TABLE 5. Summary of Pipeline Information for Alternative V

Pipeline	Location	Size	Type
Tailings Slurry Pipeline	Mill to paste plant	16 to 24 inches(1)	Steel/polyethylene dual-wall pipe w/leak detection
Reclaim water return pipeline	Paste plant to mill	16 inches	Dual-wall pipe w/leak detection(2)
Mine water discharge pipeline/make-up water pipeline(3)	Mine to waste water treatment plant to Clark Fork river diffuser	12 to 14 inches	Single-walled pipe w/leak detection
Mine segregation water pipeline (option for later development)	Mine to waste water treatment plant	10 inches	Type undetermined at this time
Concentrate pipeline	Mill to rail loadout facility	3 inches	Dual-wall pipe w/leak detection(2)
Concentrate return water line	Rail siding to paste plant	2 inches	Dual-wall pipe w/leak detection(2)
Storm water return pipeline	Paste facility site storm water retention pond to paste plant	6 inches	Single-walled pipe w/leak detection

Source: Hydrometrics 1997
Notes: (1) The final pipeline diameter will need to be determined based on tailings viscosity and topographic analysis of final pipeline corridor.
(2) The type of dual wall pipe has not been determined at this time.
(3) Mine water is estimated to meet mill make-up water requirements; however, a contingency make-up water well site has been identified near the Clark Fork River in the event that insufficient mine water is available. In this event, make-up water would utilize the discharge pipeline.

Powerlines. Sterling would construct 5.3 miles of 230 kV transmission line with 61-foot-high wooden utility poles, dark porcelain or polymer insulators, and nonspecular conductors to reduce contrast within a 100-foot right-of-way. The transmission line would parallel the new FDR No. 150 until it intersected existing FDR No. 150 and then continue to parallel the existing FDR No. 150 to the mill. Sterling would construct new switchyard adjacent to the existing Noxon/Libby 230 kV line near Montana Highway 200 in a dedicated power line right-of-way. Two new substations would be constructed:

- one substation would be constructed at the mill site to distribute electricity through lower voltage lines to equipment within the mill site, adit, and mine; and
- a second substation would be constructed near FDR No. 150 in the vicinity of the tailings paste facility for electrical distribution to that area. This would involve clearing a 100 by 100 foot area and fencing it.

The rail loadout facility and the relocated evaluation adit support facilities site would be supplied power from a local distribution line along Government Mountain Road. Sterling would be responsible for paying all construction costs for the substations and transmission line. Annual power consumption is estimated at 95,000,000 kW-hours, with a peak demand of 13,300 kW. No power provider has been selected.

Sterling would use the following measures to reduce right-of way clearing and help produce a feathered, more natural-appearing edge of timber along the utility and road corridor. These measures would be applied to appropriate segments of the corridor during the design phase:

- retaining non-hazardous trees and brush on the right-of-way;
- cutting trees at ground level to reduce visibility of stumps;
- disposing of felled material with the least possible impact on remaining vegetation; and

! selective clearing of timber adjacent to the corridor to soften the edge between cleared and uncleared areas.

Erosion and Sediment Control

Wind and water erosion control measures are described in detail throughout Sterling=s permit application in operation and reclamation plans. These measures involve 1) mechanical practices to minimize fugitive dust, 2) grading to reduce erosion potential, 3) soil-handling techniques to enhance stability, 4) hydrologic systems to control runoff and sedimentation, and 5) revegetation practices to provide a stabilizing cover. Sterling would follow Forest Service soil and water conservation practices. A storm water discharge permit may be required from DEQ. As part of this permit or the MPDES permit, Sterling would be required to submit a storm water management plan for DEQ approval. This plan would describe the methods to minimize and control runoff contamination.

Sterling would be required to implement all BMPs detailed in its permit application. In addition, a vegetation management plan would be developed by Sterling and approved by the Agencies to minimize disturbance during clearing and construction and to maximize revegetation success on all cut-and-fill slopes and reclaimed road segments. A field review would be required by agency hydrologists/soil scientists after facilities and roads have been staked in the field but before construction begins to identify any additional BMPs needed on a site-specific basis.

Sterling would mitigate for unavoidable fine sediment impacts to Rock Creek resulting from the construction of facilities and changes in the road system. Sediment mitigation measures would consist of stabilization, armoring and revegetation of existing sediment sources in the Rock Creek floodplain, and maintenance of these measures for the term of the project. Concurrent with project start-up, Sterling would mitigate an eroding cutbank where Engle Creek joins Rock Creek. Also beginning in year 1, Sterling would inventory the Orr Creek and Snort Creek basins to identify potential sediment mitigation opportunities and estimate the annual fine sediment production in tons/year for all identified floodplain sediment sources in the watershed. Sterling would submit a fine sediment mitigation plan to the Agencies for approval, and cumulatively reduce the annual fine sediment loading to Rock Creek by at least 400 tons by mitigating two or more sediment sources in the west fork basin and in the mainstem floodplain of Rock Creek prior to the end of the project construction period. Treated mitigation sites would be monitored in average to above-average snowpack years (as of April 15), or in the event of greater than bankfull discharge events. This monitoring would be needed to measure erosion of the treated sites and to quantify any need for further mitigation that would maintain the 400 ton fine sediment reduction and ensure effectiveness of the mitigation program for the life of the project.

Adit Closure

The evaluation adit would be plugged with reinforced concrete at mine closure. Since this adit would be a decline and the portal is above the water table, the purpose of the plug would be primarily to close off access and eliminate any potential for surface water inflow.

The main access adits would be sealed once mine water met ground water standards without treatment. The service and conveyor adits would be plugged with reinforced concrete near the elevation of the orebody within the mine. This would prevent 1,150 feet of water pressure that would develop if adit seals or plugs were only placed at lower elevations in the adits. The adits would be closed at the portal with non-mineralized waste rock to prevent access. Drainage from the portal (inflow to the adits below the elevation of the plugs) would be treated until it met surface water quality standards without treatment at which time it would be allowed to infiltrate into the reclaimed mill pad and underlying alluvium. Monitoring data would be used to establish discharge requirements prior to the time of adit closure.

The wilderness air intake ventilation adit would be reclaimed. Sterling would develop a plan to restore the air intake ventilation adit within the CMW to its premining appearance and configuration following mine closure. The grate and fan would be removed and the adit would be sealed with a 12-inch-thick bulkhead. The bulkhead would be constructed from within the adit using reinforced concrete. Equipment removal and plugging would be conducted primarily from inside the adit. Rock from adjacent areas and/or waste rock treated with oxidating compounds would be used for the surface closure to replicate natural conditions and appearances. Sterling would investigate the potential for creating bat habitat at both the evaluation and air-intake ventilation adits. Depending upon the results of the study, agencies may require modification to adit closure plans to accommodate bats.

The adit closure plan would need to be finalized and submitted to the agencies for review and approval prior to mine closure.

Reclamation

An updated, detailed reclamation plan that covered revegetation of all mine facilities would need to be submitted for Agency review and approval before mine construction. The plan would provide the means to ensure adequate reclamation and minimize visual impacts of the project. Plans for reclaiming any Forest System roads, if required, would be submitted to the Forest Service for review and approval.

Short-term reclamation objectives are to stabilize disturbed areas and to prevent air and water pollution. The long-term reclamation objective is to establish a postoperational environment compatible with existing land uses and consistent with the Forest Plan. Specific reclamation objectives include the following:

- permanent protection for air, surface water, and ground water resources;
- protection of public health and safety by removing potential hazards;
- maintenance of public access through the project area;
- restoration of wildlife habitat;
- design of a land configuration compatible with the watershed;
- re-establishment of an aesthetic environment allowing for visual quality and recreational opportunity; and
- re-establishment of postoperational biological potential suitable for supporting vegetative cover appropriate to the area.

To accomplish these objectives, Sterling proposes to provide interim revegetation and stabilization of most disturbed areas, to follow measures described under Sediment and Erosion Control, and, after mining, to reclaim all disturbed areas by recontouring and redistributing soil, and revegetating.

Postmining Topography. All buildings and other structures at the evaluation adit support facilities site would be removed once the mill site was operational. It is estimated that the support facilities would be used through exploration and the first 3 to 4 years of mine construction and operation. This site would be either recontoured to approximate original contours or otherwise developed for facilities associated with the operation of the tailings paste facility.

Sterling would regrade the evaluation adit waste rock dump to approximate existing contours at the end of operations, eliminating any bench at the adit portal. Waste rock from the lower Revett Formation,[7] a rock formation with similar characteristics to surface rock, would be used for the surface layer of the dump, especially for the portion that would be left unvegetated. If necessary to meet visual quality objectives, waste rock surfaces that remained exposed after reclamation would be treated with oxidizing compounds to blend them with adjacent talus (Reynolds 1995). Where possible, existing trees at the outer edge of this talus slope and existing pockets of trees and shrubs within this talus slope would be retained and would not be damaged during dumping. Reclamation of the evaluation adit portal would be the same as described for Alternative II. If stockpiled ore at the evaluation adit proved uneconomical to process, ASARCO would develop a plan, subject to review and approval by the Agencies, to dispose of the ore in conjunction with reclamation of the evaluation adit.

[7] This rock type would be the last waste rock removed from the evaluation adit. Due to variations in rock types within the formation, it may be necessary to stockpile quartzite material that closely resembles surface talus to blend the new rock dump with the existing talus as much as possible. This material would be stockpiled on the bench or stored in the adit until ready for deposition as the final layer on the rock dump.

A channel would be constructed across the evaluation adit waste rock dump from the area of the backfilled lined pond to the access road cut to connect natural drainage areas above and below the evaluation adit dump. This channel would be lined with coarse rock to prevent erosion. Disturbances other than the evaluation adit waste rock dump (i.e., facilities area, diversion ditches, fuel storage area) would be graded to blend with adjacent undisturbed topography.

Sterling would be required to submit detailed design, regrading, and revegetation plans for all mine facilities for agencies' approval in conjunction with the final design of the paste facility. Landform design for the tailings paste facility would incorporate topographic templates from the surrounding area to help meet reclamation goals and Forest Service visual standards. These plans would result in reclaimed sites that decrease landform and vegetation differences between mine facilities and surrounding natural landscapes.

The diversion structures above the reclaimed tailings facility would remain as permanent stream channels to route runoff around the reclaimed tailings mass. All mechanical facilities associated with the tailings facility would be removed. The remaining surface disturbances (e.g., runoff control ditches, seepage capture and storm water ponds, facility pads, soil stockpile sites, emergency dump ponds, and internal and perimeter access roads) would be returned to approximate original contour.

After mining and ore processing were completed, all mill buildings and related equipment and infrastructure, the conveyor, and the power line would be dismantled and removed. Paving material would be buried on site or removed to a disposal facility. Inert waste such as steel, concrete, plastic, or wood would be buried in on-site waste disposal areas or sold to scrap dealers for recycling; some waste may be transported to an approved waste transfer station as authorized by the county solid waste district. Buried pipelines would remain in place except at stream crossings..

Once ground water quality beneath the tailings facility met ground water quality standards and MPDES limits without treatment, and Sterling was given permission to shut down the seepage collection system, all remaining tailings facility-related surface components would be removed, and the sites regraded according to approved plans. Wells would be decommissioned once monitoring was no longer required or the well was no longer required (i.e. a contingency pumpback well used to control seepage when control was no longer a need). When the waste water treatment facility would not be needed for treating tailings seepage and/or mine adit discharge, the buildings, related equipment, and surface discharge pipelines would be removed and the sites regraded to approximate original contour.

Final reclamation of portions of mine facilities, such as outer slopes of the mill site pad and completed portions of the tailings paste facility would be done as early as possible to assist in decreasing the visual impact of the project. Toe buttresses and paste layers creating the deposit surfaces, and the compacted paste zone of the Bottom-Up option, would be designed to minimize straight horizontal crests, long linear contours, and uniformly sloping surfaces; however, stability requirements would have precedence. Contours of reclaimed surfaces, including those on the top surface of the deposit, would mimic those of surrounding topography. Both regrading and selective placement of the paste during deposition would be used to create topographic pockets, swales, ridges and surface water drainages. Rocky soils and possibly cement additive would be used in steepened drainageways to create naturalized swales and help break up the massiveness of the deposit.

Vegetation Removal and Disposition. The mining company must prepare a Vegetation Removal and Disposition Plan that deals with the potential uses of vegetation removed from areas to be disturbed. The plan must detail disposition and storage plans during mine life. The vegetation debris piles and surface lift soil piles containing large quantities of organic debris should be stored in carefully selected storage sites to prevent off-site impacts from the production of low quality organic acids as the materials begin to decay.

Where possible, slash from timber-clearing operations would be salvaged for soil protection. Large or whole pieces could be used as physical barriers and catchments and ground-up slash would be used as mulch or as an additive to stored topsoil. Large or whole pieces also could be used to enhance or create desirable fisheries habitat in Rock Creek according to aquatic/fisheries mitigation plans. All mulching materials would be certified weed-seed free.

Soil Salvage and Handling Plan. Direct haul soil salvage and replacement would be required for use whenever and as much as possible to enhance revegetation success of native unseeded species. Most soil would have to be stockpiled. Areas such as road cut-and-fill slopes, power line pole locations and access roads, and other disturbances that would remain postmine should be reclaimed as soon as final grades are achieved with direct haul soil or soil that has been stockpiled for less than 1 year. This would increase the chances of direct transplantation and propagation of many of the local ecotypes on the reclaimed surface.

Soil stockpiles would be constructed with a 2.5:1 side slope and 3:1 ramps. Soil stockpiles would be incrementally stabilized (rather than waiting until the design capacity was reached) to reduce erosion and maintain soil biological activity in the surface. Soil stockpiles would have organic matter added to help retain soil quality. Seeding would be done as soon after disturbance as possible rather than waiting until the next appropriate season. Fertilizer and mulch would be applied to the piles as necessary. Sediment traps would be used downslope where necessary to minimize soil movement.

In forested soils, it is advantageous to stockpile the surface organic and mineral horizons and store them separately from subsoil mineral horizons. Ideally, this would mean that the surface 6-12 inches of organic materials and soil would be separated from the subsurface 12-18 inches of soil in a 24 inch soil replacement profile. To pick up a uniform 6-12 inch organic and mineral layer in a forested setting is not practicable. Soil would be salvaged in a two-lift process with the first lift being the more suitable topsoil and the second lift being subsoils excavated up to 36 inches; average total salvage depth equaling 24 inches. Replaced soil depths would average 24 inches over the tailings paste facility, the mill site, and the waste water treatment facility site. If extra soil is available at the mill site, it should be stockpiled for use at the paste facility or other locations. DEQ requires salvage of rocky soil (less than 50 percent rock fragments) if it is characteristic of the area. Shallow and rocky soils would be salvaged at the evaluation adit and at the mine portal if present. Sterling would be required to submit a revised soil salvage and handling program that deals with two lift salvage and storage practices and concerns over water quality, and direct haul soil replacement on acreages reclaimed during mine life.

Soils salvaged from 7.7 acres at the evaluation adit site would be removed in two lifts where soil was available and where slopes were less than 2:1. The soil would be stockpiled northwest of the evaluation adit (see Figure 3). All of the first lift soil and half of the second lift soil would be redistributed over 5.0 acres at the adit, waste rock dump top, and facilities to an average total depth of 12 inches. The remaining second lift soils would be redistributed over a portion of the slope face of the dump designated for revegetation at an average depth of 13 inches over 1.9 acres. Approximately 1.4 acres on the waste rock dump would be left as talus to achieve a mosaic appearance.

Because the paste would be deposited layer upon layer, soil would be stripped just ahead of the extent of the proposed disturbance for each layer. The first soil stripped from the first two or three layers would need to be stockpiled for reclaiming the final segment and outer slope. At times soil being salvaged may not be suitable for the portions of the facility that need to be reclaimed; this soil also would be stockpiled until needed for other purposes. The soils would be segregated according to rocky or non-rocky soils and first lift versus second lift and, if necessary, stockpiled adjacent to the deposit site (see Figure 2). Sufficient volumes of the colluvial and alluvial soils, including their rocky subsoils, within the tailings paste facility footprint would need to be salvaged and stored for use in reclaiming slopes 8 percent or greater and along reconstructed drainage ways to minimize erosion. Based on experience and preliminary research to control erosion at Golden Sunlight Mines, the lacustrine soils could be mixed with the rocky subsoils or crushed bedrock to produce a soil with 20% rocks greater than 1 inch in diameter. The mixed soil must also have less than 20% very fine sand in the fine soil matrix. The lacustrine soils could be placed on all slopes less than 8 percent (approximately 12.5:1) without the addition of rock materials as long as the slope length is limited by armored drainageways or other erosion control features. The final design of the paste facility would also need to include a volume determination of soil types needed based on the slope breakdown of the paste facility.

Sterling would need to conduct a more detailed soil survey to accurately determine the amounts and types of soils available for reclamation prior to construction of the paste facility and associated facilities. Since rocky materials are also needed for constructing the toe buttresses, the survey is especially important to ensure there is enough material available for both requirements or to identify the need to obtain more rocky material from other sources.

The tailings paste could, if needed, have organic amendments or fertilizer added to the uppermost lift. This material, which would have no cement added, may need to be ripped prior to soil replacement to minimize the development of a root-barrier zone. Both regrading this material and selective placement of the paste during deposition would be used to create diverse topographic pockets, swales, ridges and surface water drainages constructed to a predetermined surveyed gradient in the final design. Overall outer slopes would range between 2H:1V and 5H:1V. These slopes would be protected against erosion using BMPs.

Disturbed areas, especially parking lots, roads, and building sites, would be ripped prior to soil replacement to reduce any root zone barriers due to compaction and to facilitate storm water infiltration after reclamation. Any disturbed area to be seeded would be scarified to a depth of 6 to 12 inches prior to seeding for best seed establishment. Where soil fertility may be low and tilth poor, organic matter (weed-free aged manure, compost) would be incorporated into respread soils before planting.

Revegetation. Sterling would develop a detailed final planting design for all disturbed areas including the area between the impoundment footprint and the highway. Final designs would avoid uniform distributions of plants, with planting densities, species selection, and their distributions repeating natural patterns in the surrounding landscape. A combination of planting designs, natural mortality, and possible thinning of thick tree stands would achieve a natural-appearing mosaic of vegetation on reclaimed areas. Forest Service standards for revegetation would be required on NFS lands.

Sterling proposes to meet short- and long-term objectives stated in its revegetation plan. The plan specifically addresses species selection for final and interim seed mixtures and planting schemes, seeding and planting rates, seedbed preparation, seeding and planting methods, cultural treatments, and interim revegetation. The proposed seeding and planting mixes are presented in Appendix J of the final EIS and the applicant=s proposed reclamation plan (ASARCO Incorporated 1987-1997). Weed seed-free seed mixes would be modified to include grass and forb species suited for quick stabilization as well as those needed for long-term wildlife habitat needs. Locally collected seeds and plants would be used whenever possible.

The proposed species selection and seeding/planting rates are based on preoperation vegetation types, environmental tolerance, species that exhibit hardiness on postoperational sites, and a variety of other factors. An understory seed mix consisting of grasses and forbs would be used on all disturbance areas. Shrubs would be seeded on most sites, but not on the evaluation adit site or the transportation and utility corridors.

Grass species proposed, including both native and non-natives, are typical of those used for reclaiming sites in similar settings. Forbs and shrubs proposed are native species that typically occur in one or more of the communities identified within the project area. No clovers would be planted on any disturbed areas during mine operation, as clover is a bear attractant. An annual cereal grain would also be added to the mix to ensure rapid cover. Seed mixtures may be modified due to limited species availability, poor initial performance, advances in reclamation technology, or a variety of other factors.

Seeding rates would average about 120 pure live seeds per square foot (13 to 16 pounds per acre) for drill seeding and roughly twice that for broadcast seeding. Drill seeding would occur on slopes of less than 3:1 (horizontal to vertical) that are not rocky as determined by the Agencies. Steeper slopes and rocky areas would be broadcast or hydroseeded (a technique where seed is mixed into a slurry and sprayed onto a slope). Seeding would occur in the first appropriate season following site preparation.

Sterling proposes a number of cultural treatments for seedbed preparation. Sites would be prepared for seeding by grading; ripping to prepare the surface for soil placement; respreading salvaged soil; and tilling soils on gentle slopes (3:1 or less) to break up clods and relieve compaction, as needed. Phosphorus fertilizer, important for seedling establishment, would be applied prior to seeding. Once seeding occurred, straw mulch would be applied and anchored according to slope steepness and seeding method. Nitrogen fertilizer would be applied early in the subsequent growing season to enhance growth.

Successful establishment and growth of trees are necessary to obtain the greatest visual mitigating effects on and adjacent to mine facilities. Given the importance of mycorrizhal fungi for tree growth and establishment, Sterling would obtain locally grown tree seedlings from an appropriately inoculated soil medium. Legume species would be inoculated with appropriate nitrogen-fixing bacteria. Other methods such as transplanting native shrubs and/or very small trees could be proposed. Fertilizer requirements and planned fertilizer applications would be carefully calculated to minimize nutrient losses due to deep leaching.

Shade cards or other methods would be used to protect tree and shrub seedlings, especially on south- and west-facing slopes of the impoundment and mill site. New tree and shrub plantings would be protected from wildlife browsing by netting. Drip-irrigation would be used during April through early June for up to 3 years after planting trees and shrubs on the tailings paste facility face to help with plant establishment.

Trees would be planted on slopes that do not exceed 3:1 in the tailings impoundment area, the facilities area, the waste rock dump top, and the access road to the waste rock dump. Trees would be planted in 2-to-4-foot-wide strips alternating with 8-foot-wide strips that were drill seeded. Trees would be planted 6 feet apart to achieve an initial stocking rate of 663 trees/acre. Planting patterns would be modified as needed to better mimic natural vegetation patterns on adjacent undisturbed lands. Reforestation of the transportation corridor and the evaluation adit area would rely on natural regeneration. Shrubs would also be planted on the tailings facility face. Shrubs would be planted on the access road cuts, only if herbaceous vegetation was not providing adequate erosion control.

During mine life, Sterling would also reclaim all cut-and-fill slopes along the access roads, and the adit portal slopes to maximize native plant establishment and minimize erosion, weed invasion and visual impacts during mine life. Interim reclamation plans would be developed with agency reclamation specialists to reduce slopes if practicable to approximate postmine contours wherever possible. Slopes reclaimed during operations would be revegetated with the permanent seed mix and planted as per the approved plan. This aggressive reclamation program is designed to increase native plant establishment, increase sediment and erosion control, limit noxious weed invasion, and reduce visual impacts during mine life.

Throughout mine life, disturbances would be seeded as they occurred with the permanent seed mix. Final revegetation (seeding) would occur in some areas during the preoperational phase; others would be revegetated incrementally when possible, such as the tailings paste facility. Final revegetation of all other disturbances not previously reclaimed would be completed within 2 years after mining.

Sterling would finalize a detailed planting plan for the mill site. Final revegetation of pad faces would occur as soon as the pad was completed. It would be seeded with grasses and forbs and planted with containerized shrubs and trees. Plantings would mimic natural patterns of vegetation.

Reclamation of the tailings paste facility would be somewhat different from that of a traditional tailings impoundment. Concurrent topsoiling and reclamation would allow the portion of the top and outer slopes of the paste facility that had achieved final grade to be reclaimed while the next segment was constructed. Final reclamation of outer slopes of the paste facility constructed using the Bottom-Up option would occur on an annual basis unless specified otherwise by the agencies. Final reclamation of the surface would begin as soon as the paste deposition segment reached final grade and deposition began in the next segment.

Interim revegetation would occur on an on-going basis. An interim seed mix would be added to the paste before its deposition to limit erosion off paste slopes during operations and to reduce aesthetic impacts. A color tackifier or hydroseeding would also be applied to deposit lifts as needed for interim reclamation and stabilization prior to initiation of final reclamation activities. Both toe buttresses and paste deposit slopes would be seeded annually with final revegetation mix on any portion that reaches final grade.

Trees would be planted on each segment as it was reclaimed and seeded with approved planting mixes of grasses, forbs, and shrubs. The applicant has planted trees for screening between the main power line and Montana Highway 200; however, the planting would be inspected during evaluation activities and any dead, dying or missing trees would be replaced to achieve the required density.

Sludge would be removed from the aeration pond after the water treatment system was decomissioned and dismantled, dried, and enclosed in a geomembrane lined cell in the tailings paste facility. The substrate would be buried in the facility under a graded compacted layer of at least 6 feet of tailings near the embankment face. Topography in the area of the cell would be mounded to prevent excess water from potentially moving through the substrate. Reclamation of the mounded tailings over the aeration pond slurry cell substrate would be completed by applying a minimum of 24 inches of soil, followed by revegetation.

The aeration pond would be backfilled with clean subsoils to a mounded configuration to produce an area which would limit infiltration through the old pond area. Then the mounded subsoil area would be covered with a surface lift of soil and revegetated. Bond would be calculated to cover this reclamation modification and would include the salvage and storage of the materials needed to complete the reclamation at mine closure.

The pipeline would be built and installed and covered with at least 24 inches of soil that had been salvaged prior to construction. No trees or shrubs would be seeded along the pipeline corridor, but any trees or shrubs that volunteered would be left. Trees that encroached on power line conductors or were in the way of maintenance vehicles would be removed. Maintenance or replacement of a pipeline liner would require some redisturbance of a small area that would be immediately reclaimed after the work was done. When the pipelines were no longer needed they would be removed for a distance of 15 to 20 feet from stream crossings and where the pipes surfaced at the mill, the paste plant, the waste water treatment facility, and the Clark Fork River. The pipes would be completely drained, capped, sealed, the ends reburied, and the redisturbed section regraded, stabilized if necessary, and revegetated. The buried segments of the pipeline would remain in place.

At the end of mine life agency reclamation personnel would review the reclamation success on the slopes and decide if the successful portions with up to 20-30 years of vegetation growth could be left in the final reclamation plan. Portions with unsuccessful reclamation would be recontoured as per the reclamation plan and soiled or rocked accordingly.

Monitoring and Mitigation Plans[8]

Air Quality Monitoring. Sterling would be required to monitor air quality around the operation as part of its air quality permit. The specifics of the monitoring plan would be reviewed annually. The purpose of the plan would be to evaluate the effectiveness of implemented air pollution control technologies.

Rock Mechanics Monitoring*. Sterling would submit a separate surface and underground monitoring and testing plan once underground development had progressed enough to establish monitoring points. Its purpose would be to define the existing geologic stress field and its response to underground mining. The plan would specify monitoring equipment, locations, and frequency of monitoring and reporting, and define types of laboratory tests and frequency of testing. The information would be used in planning the size and location of underground openings and support pillars, identifying locations needing additional support and areas to be avoided for final mine development, and for making predictions about long-term behavior of the underground rock mass. Once mining was underway, Sterling would be required to submit detailed mine development plans in advance of entering areas of suspected rock instability as identified in the preliminary design and during the underground monitoring program. These reviews could result in Sterling leaving more in-place ore for support than was originally intended, or conversely the information could suggest areas where pillars could be removed without jeopardizing the long-term stability of the site.

Acid Rock Drainage and Metals Leaching Plan*. Alternative V incorporates recommendations from a third-party technical analysis and risk assessment (Failure Modes Effects Analysis) that evaluated geochemistry data that relates to the Rock Creek Project (Klohn-Crippen 1998). The Acid Rock Drainage and Metals Leaching Plan, located in Appendix K of the final EIS, would include additional geochemical testing as recommended by Klohn-Crippen for the Rock Creek evaluation adit, mine operations and the Troy Mine. This testing would provide for

[8] Plans with A*@ contain components that would be required during evaluation adit construction.

static testing of Rock Creek and Troy Mine representative ore, waste rock (for constructing the mill site, paste facility buttress, and crushed rock around finger drains beneath the paste landfill) and Rock Creek/Troy Mine tailings. Kinetic testing would verify metal dissolution/oxidation and metal leaching processes as identified by static testing for all waste rock and tailings. Mitigations based on testing results are discussed. Premature shutdown considerations for waste rock and tailings testing results are also included. For further discussion regarding monitoring or water quality impacts from waste rock and tailings, please refer to the Water Resources Monitoring Plan described briefly below and in more detail in Appendix K of the final EIS. Monitoring requirements are also set forth in the MPDES permit statement of basis in Appendix D of the final EIS.

The agencies would require that waste rock used for construction of the mill site, paste facility buttress and around the finger drains beneath the paste landfill be thoroughly tested, including long term geochemical testing as waste rock is generated. Waste rock would be generated during adit excavations. Evaluation adit waste rock would be end dumped at the portal. Waste rock from the twin mine adits (access adits) would be used in the tailings retaining structures and the mill pad. Evaluation adit waste rock would be produced for at least 1 year before construction of the twin production adits (which provide facility construction rock) would begin. Once mining begins, waste rock that might be generated, say in ramps that are outside the ore body, would be placed underground in mined out areas. Mineralized waste rock would be placed underground or encapsulated in the paste facility to minimize the potential for acid rock drainage or metals leaching. However, mineralized waste rock at the evaluation adit may be encapsulated in place if it could not be hauled into the mine or down to the paste facility.

Evaluation Adit Data Evaluation Plan. Data would be collected during construction of the evaluation adit. The conceptual plan is described in more detail in Appendix K and contains components of the Acid Rock Drainage and Metals Leaching Plan (see previous paragraph), the Rock-Mechanics Monitoring Plan (described above). The evaluation adit data would be compared to the data used in analyses in the final EIS to verify the analyses. The data would be used to fine tune and modify various plans and designs such as the waste water treatment systems, water handling plans, waste rock handling, the tailings paste facility construction methods, and mine design and operation. If plans and designs could not be modified so that environmental impacts would be no greater than disclosed in Chapter 4 of the final EIS for Alternative V, then a permit revision would be required and would be subject to the appropriate level of MEPA/NEPA analysis and public comment and review. The construction of the mine and mill facilities could not begin until the agencies had reviewed the data and the modified plans and designs. The agencies would then have to determine that either no additional MEPA/NEPA analysis was needed or that additional MEPA/NEPA analysis was required and completed and agency decisions were made to approve the revisions to the permit, if appropriate, before mine construction and operations could begin.

Tailings Paste Facility and Tailings Slurry Line Construction and Operation Monitoring Plan. The intent of the construction monitoring plan for the tailings paste facility and associated tailings slurry lines, would be to establish standard of care construction implementation, testing, and reporting guidelines. The plan would outline construction quality assurance (QA) and quality control (QC) protocols to ensure that any constructed facility was being constructed to the design and performance standards set forth in the application and the design documents. Prior to construction ASARCO would submit a construction monitoring plan to the Agencies for approval. The construction monitoring plan for the tailings paste facility and the tailings slurry line is divided into four discrete time segments. The four time segments are as follows:

- Final Design Phase: Agency review and approval of final designs for tailing paste facility, paste plant, tailings slurry lines, and emergency dump ponds.
- Preproduction Construction Phase: Standard inspection and quality control procedures would be implemented with periodic interim construction reports submitted at 2-month intervals during construction of toe buttresses. A final construction report would be submitted prior to operation. This report would contain as-built drawings.
- Operational Phase: Monitoring would continue throughout project life and would include routine inspections and reports of facility geometry, material specification, embankment drainage, foundation pore pressure, and observational performance.
- Interim Facility Shutdown: In the unlikely event of a shutdown, the tailings facility monitoring plan would be continued.

Water Treatment Plant Construction and Operation Monitoring Plans. The intent of the water treatment construction and operation monitoring plan is to establish QA/QC practices and operational standards for the water treatment plant and all appurtenances. The operating plan will include operating protocols, water quality treatment standards, and contingency plans for system upset or malfunction. These plans will be submitted to the Agencies for approval prior to plant construction.

Mine, Mill and Associated Facilities Construction and Operation Monitoring Plans. All mine and mill facilities will have construction and operation monitoring plans. These plans will outline standard of care construction practices for these facilities, and will include information of testing, monitoring, and reporting. The site location of certain facilities may encroach on sensitive habitat, and construction practices will be clearly defined in regards to building in these areas so as to minimize impacts.

The intent of the operating plans is to establish protocols for the operation of all facilities so as to ensure standardized performance. The operating plans will address daily operations, contingency plans, system upsets and performance criteria. The plans will be submitted to the Agencies for approval prior to construction.

Soils and Erosion Control*. All reclaimed areas would be inspected for erosion in spring and fall until they became stabilized. Evidence of erosion would be repaired and reseeded. An approved monitoring schedule would be developed for the tailings impoundment during the final design phase.

Soils would be tested for fertilizer needs and macronutrient content. Tailings and waste rock would be sampled for constraints to revegetation including texture, coarse fragment content, and pH. Structural measures would be taken to prevent erosion and sedimentation.

Reclamation Monitoring Plan*. Revegetated areas would be field checked during the first season following revegetation to determine success. Monitoring would include qualitative evaluation of cover, species composition, and tree planting success. If problem areas were identified, remedial action would be taken. Evaluation of site-specific reclamation would also be conducted on rights-of-way, the tailings facility outer slopes, and the evaluation adit waste rock dump. Evaluation parameters would include species response, soil distribution depth, planting techniques, effects of fertilizer rates, and reclamation success on steep, rocky slopes.

Sterling would be required to finalize a detailed reclamation monitoring plan, subject to agency approval, that would address reclamation/soil stability during mine life as well as after closure. Since establishment of trees takes 5 to 7 years at a minimum, Sterling would carry out a long-term monitoring program for up to 20 years after mine closure. Specific measures would include:

- monitoring soil salvage and replacement to verify depth and suitability;
- inspecting for erosion in spring and fall and after heavy rain and implementing immediate erosion-control measures, if necessary;
- monitoring construction activities to identify sources of erosion and to audit implementation of BMPs;
- conducting soil chemical tests to identify soil nutrient needs or toxicity problems prior to respread of soils and in areas of poor revegetation; and
- inspecting all seeded and planted areas annually during the active growing season to identify poor plant growth or damage and implementing remedial actions.

After final reclamation, revegetated areas would be protected for 2 years where necessary from vehicle and livestock use. Control of wildlife damage would be attempted. A noxious weed control plan would be developed in accordance with the Sanders County Weed District and, where applicable, with Forest Service guidelines. No postoperational treatments (except nitrogen fertilizer) would be implemented other than normal forest practices.

Water Resources Monitoring Plan*. ASARCO would submit a comprehensive long-term surface and ground water quality monitoring program (see Appendix K in the final EIS). Data collected from the monitoring program would be reviewed to evaluate the extent and magnitude of potential impacts during the proposed project's construction, operation, and postoperational periods. In conjunction with this plan, a Monitoring Alert Levels and

Corrective Action Plan would be developed to ensure early detection of potential environmental degradation. The plan would identify alert levels, which when exceeded, would trigger a contingency or corrective action to be implemented.

Monitoring of Rock Creek, the Clark Fork River, and ground water in the vicinity of the mine and the paste facility would resume during evaluation adit construction to expand the monitoring baseline. Additional sites in the East Fork of Rock Creek, Copper Gulch, and the East Fork of Bull River may be required. Sterling would also conduct an additional springs and seeps survey above and below the ore body. Sterling would verify all water rights down gradient of the mine and resample all domestic wells and springs associated with those rights.

Long-term postoperational surface water monitoring of streams and springs would continue until the Agencies determined that water quality met State standards. Sampling stations would be located primarily on the main stem and east and west forks of Rock Creek, Miller Gulch, and the Clark Fork River.

Long-term postoperational ground water monitoring would focus on tailings impoundment seepage and ground water quality inside and outside the permitted mixing zone. Monitoring wells associated with the proposed seepage interception system would provide data to evaluate the system's effectiveness. Additional monitoring and interception wells may be added if monitoring showed degradation outside the approved mixing zone. Adit and mine discharge and seepage through the waste rock dump and mill pad also would be monitored.

Additional ground water quality sampling would be conducted at specified monitoring wells prior to construction of the proposed tailings facility to document water quality conditions in the tailings facility footprint downgradient of the decommissioned Noxon sanitary landfill. Samples would be analyzed for physical parameters, nutrients, common ions, metals, volatile organic compounds and semi-volatile organic compounds. If the results of sampling indicate the landfill is a potential source area for contamination, appropriate steps would be taken to mitigate the potential for additional problems in the future. Mitigative measures could include, but not be limited to covering the landfill area with an impermeable synthetic material to reduce commingling of tailings leachate with landfilled materials.

Monitoring of lake levels would continue at Cliff and Copper lakes because mining could cause fractures that may extend to the surface thereby affecting lake levels although the potential for subsidence is small. If increased seepage was noticed in the mine workings, mining in the affected section would be halted and the problem investigated. The lakes would be visited and continuous lake level data would be retrieved and analyzed. During this period, additional grouting would be required. Upon further data analysis, more measures could be required to lower the seepage rate. A plan to mitigate impacts to wetlands potentially affected by draining of these lakes would be developed as part of Sterling's wetlands mitigation plan.

Assuming adit portals could not or would not be permanently sealed, postoperational adit flow would be discharged to the Clark Fork River via the water treatment system until it met water quality standards without treatment. Monitoring would be continued according to MPDES requirements. Sterling would investigate and fund alternative measures to ensure adit plug stability and postoperational adit water quality.

Influent and Effluent Monitoring*. The influent to the water treatment systems would be monitored for nitrogen and other parameters identified in the proposed draft MPDES permit in Appendix D and the monitoring plan attached in Appendix K, both are contained in the final EIS. Characterizing the influent is critical for maintaining a consistent effluent. The influent would be monitored continuously so that system adjustments could be made whenever required.

Monitoring the effluent frequently is also critical in determining whether the treatment systems are operating properly and allowing adjustments to be made to the system to maintain a quality discharge. Effluent measurements would be made more frequently than required in the draft MPDES permit; the revised draft permit would require weekly or monthly monitoring depending on the parameter. Nitrates would be measured continuously with an on-line analyzer. These water quality results would be verified through weekly or monthly samples, depending on the parameter, and would be analyzed by a certified lab for permit compliance purposes.

Monitoring of Biological Oxygen Demand*. Methanol would be added to the ABCs in an amount sufficient to sustain biological activity, but in small enough amounts to avoid excess Biological Oxygen Demand (BOD) in the effluent. Excess BOD, similar to excess nitrogen, could cause unwanted aquatic growth. BOD in the effluent would be measured on at least a weekly basis.

Plant Species of Special Concern Mitigation Plan*. Additional on-site verification studies would be performed during development of final facility designs to precisely locate KNF sensitive plant populations as well as populations of MNHP plant species of special concern for avoidance. Sterling would be required to conduct or fund a conservation assessment if wavy moonwort or other sensitive species were located during final site surveys and preparation could not be avoided. Whenever the KNF sensitive species list is updated, Sterling would be required to revisit the various surveys conducted within the project area to determine whether or not those species as well as any new MNHP plant species of special concern had been identified and to determine whether or not suitable habitat for any of those species was located within the project area and sites scheduled for disturbance but not yet disturbed. If species were found or if suitable habitat exists, Sterling would need to conduct additional surveys to either relocate the populations previously identified in the surveys or determine whether or not these new species were to be found within the project area and if they would be disturbed. These reports would be submitted to the agencies along with plans, if necessary, for changes to the operating permit needed to avoid disturbance of these species. If avoidance could not be achieved, then a conservation assessment may be required by the Forest Service.

Wildlife Mitigation and Monitoring Plans*. Sterling=s fish and wildlife mitigation plan was formulated to minimize and/or mitigate the effects of the mine operation. Mitigation measures proposed include the following:

- conspicuously posting all applicable State and Federal hunting, fishing, trapping and recreation regulations. Meeting with appropriate regulatory agencies to discuss regulations to be posted, locations of signs, and any special regulations pertinent to adjacent lands;
- developing and enforcing wildlife policy to prohibit carrying of firearms in Sterling vehicles, hunting within Sterling property by employees and the public, unauthorized off-road vehicle use in the project area, and to discourage wildlife harassment and littering;
- minimizing vehicular disturbance by dust suppression, paving, speed limit enforcement, and encouragement of carpooling;
- cooperating with appropriate agencies regarding trespass, game violations, or other wildlife problems; and
- maintaining access to public lands adjoining the project area.

Sterling=s fish and wildlife mitigation plan would be modified to incorporate the following measures to monitor and mitigate impacts on wildlife (a separate plan is described below for aquatics and fisheries mitigations and monitoring requirements):

- monitoring or funding USFS monitoring of closed roads and trails (such as Government Mountain and Orr Creek roads) to determine if inappropriate use was occurring;
- creating bat habitat in the evaluation adit and/or the air-intake ventilation adit, if determined to be appropriate by the Agencies; and
- using selection criteria for the air-intake ventilation adit site in the CMW that would help minimize impacts to mountain goat habitat.

Additional mitigation measures to prevent or minimize disturbance to harlequin ducks during breeding season include:

- limiting operating seasons during construction[9],

[9]Specific construction activities restricted by the limited operating season conditions during construction phase include hauling of waste rock from the adits to paste facility, bridge construction or reconstruction, road construction or reconstruction and within the areas where disturbance would be a factor, construction of the water pipeline across the lower portion of Rock Creek, construction of paste pipelines across Rock Creek, and construction of the utility corridor at locations where disturbance

- busing of mine employees,
- relocating the evaluation adit support facility to lower elevation,
- eventually closing and reclaiming FDR No. 150B,
- screening of disturbance zones, prohibiting camping on Sterling lands,
- monitoring water quality and developing a hazardous material spill plan relative to harlequin ducks;
- designing FDR No. 150 to minimize stopping adjacent to the creek while being consistent with appropriate safety standards.

The agencies would continue working with MDFWP to try to institute a delay of fishing season opening date on Rock Creek. Additional harlequin duck mitigations are planned and identified in the Wildlife Mitigation Plan pending agency and Sterling negotiations.

Mitigations to prevent road impacts to fisher include wildlife diversion structures along FDR No. 150. Lighting mitigations would be incorporated at the mill site to avoid attraction of and mortality to night migrating songbirds.

Mitigation for several species would be accomplished concurrently with grizzly bear mitigation. These would include road closures for wolverine, and securing of private land habitat for fisher and lynx. Although the securing of private land would not create any additional habitat (however, road closures do increase habitat effectiveness), this mitigation would secure the sites from almost inevitable habitat alteration as a result of regional increases in human development unrelated to the project. Removal of carcasses killed by vehicles from roadsides would reduce mortality risk to carrion eaters other than grizzly bears.

Other mitigations would include funding for Montana Department of Fish Wildlife and Parks (MDFWP) law enforcement personnel to protect mountain goats and other wildlife species, and development and implementation of information and education programs for the public about wildlife species. This mitigation would be accomplished with the positions required under the Threatened and Endangered Species Mitigation Plan.

A wildlife monitoring plan found in Appendix K would be finalized to:

- coordinate with other programs to monitor impacts to neotropical migrant birds;
- assess mountain goat population trends, habitat use, and responses to mine-related impacts in cooperation with MDFWP;
- gain an increased understanding of wolverine and mountain goat population trends as a result of mine-related effects and other regional effects, to help ensure prompt detection of declining population trends, should they occur. Current monitoring levels would not enable wildlife biologists to detect trends in a timely fashion; and
- assess other sensitive species for population trends, habitat use, and responses to mine-related impacts in cooperation with KNF.

Threatened and Endangered Species Monitoring and Mitigation Plans*. A mitigation plan was developed by Sterling to mitigate effects on threatened and endangered terrestrial species. (Bull trout would be covered by mitigations in the Aquatics and Fisheries Monitoring and Mitigation Plans.) In addition to the measures suggested above for wildlife, Sterling would:

- construct Power lines following criteria outlined by Olendorf, Miller, and Lehman (1981) to reduce potential for electrocution of bald eagles; and
- develop and implement a grizzly bear management program in conjunction with appropriate State and Federal agencies.

In addition to what was proposed by Sterling, the following items would be required to reduce or eliminate consequences to species federally listed as threatened or endangered. The detailed mitigation plan to be implemented by Sterling and appropriate State and Federal agencies is in the Biological Assessment in Appendix B of the final EIS. The final Threatened and Endangered Species Mitigation Plan must be approved by the KNF and

---

would be a factor.

the USFWS prior to construction of the evaluation adit and several components of the plan implemented prior to or during evaluation adit construction. The items listed below incorporate the requirements of the Reasonable and Prudent Alternative, Reasonable and Prudent Measures, and the Terms and Conditions in the USFWS Biological Opinion (BO) on grizzly bears.

To reduce mortality risk to threatened and endangered species Sterling would:

- develop a transportation plan to minimize mine-related vehicular traffic traveling between Montana Highway 200 and the mill site, and minimizing parking availability at the mill site; this would be accomplished primarily by busing employees from the support facilities site or water treatment site to the evaluation adit or mill site respectively;
- not use salt when sanding during winter plowing operations to reduce big game mortality that could draw bald eagles, wolves, and grizzly (in spring) to the road corridor and increase mortality;
- remove road-killed animals daily from road rights-of-way within the permit area and along roadways used for access or hauling ore. Road kills would be moved at least 50 feet beyond the right-of-way clearing and further, if necessary, to be out of sight from the road;
- work with other mines operating in the area (e.g., Noranda) to fund a MDFWP public information and education officer to aid in grizzly bear conservation[10]. The position would be funded for 3 years and then evaluated for need to continue or modify to better benefit grizzlies. This position must be in place prior to evaluation adit construction.
- work with other mines operating in the area (e.g., Noranda) to fund a local MDFWP law enforcement position for the life of the mine[10]. The position would be funded for 3 years and then evaluated for need to continue or modify to better benefit grizzlies. This position must be in place prior to evaluation adit construction;
- bear-proof all project-related containers holding attractants and remove garbage in a timely manner;
- not use clover in the seed mix used on any disturbed areas during mine operation;
- prohibit employees from carrying firearms within the permit area, except for security personnel.
- prohibit employees from feeding wildlife, especially bears and require all mine employees to attend regular training related to living and working in grizzly bear habitat; and
- fund items necessary for implementation of a KNF food storage order in Bear Management Units 4, 5 and 6, as required by the USFWS in the BO including bear-proof garbage cans for campgrounds and possibly bear-resistant food storage/camping equipment that can be rented from the KNF to backpackers in the lower Cabinet Mountains.

To maintain habitat effectiveness for threatened and endangered species, Sterling would:

- secure or protect (through conservation easement or acquisition) replacement habitat to compensate for acres lost by physical alterations or acres with reduced habitat availability due to disturbance; 2,450 replacement acres would be required of which 100 acres must be located in the north-south corridor to mitigate for habitat constriction. Out of that 100 acres, 53 acres would have to be acquired prior to evaluation adit construction, the rest would be acquired as outlined in the biological assessment and the biological opinion--all acquisitions must be approved by the KNF and the USFWS; and
- fund grizzly bear habitat enhancement activity on 484 acres that include but are not limited to prescribed fire, road closures, and road obliteration;

To reduce mortality risk, maintain habitat effectiveness, reduce incidental take and avoid jeopardy for threatened and endangered species, Sterling would:

---

[10] This would be the same position as required in the RODs for the Montanore Project for threatened and endangered species mitigation, not an additional one.

- work with private and corporate landowners within and adjacent to the Rock Creek drainage to close their roads to benefit grizzly bears;
- fund 5.22 miles of road closure by the KNF on NFS lands as well as possible closure of other roads and trails associated with the 2,450 acres of lands acquired to maintain habitat effectiveness as described above;
- fund KNF monitoring of recreational use on the Rock Lake and St. Paul Lake trails to assure use levels do not exceed the "high use" designation. A recreational use management plan would be developed to ensure high use does not occur and would be implemented when high use occurred during one bear season.

To reduce mortality risk and maintain habitat effectiveness for threatened and endangered species, KNF would close a total of 5.22 miles: 1.61 miles of FDR No. 2285 (Orr Creek Road), 0.51 miles of FDR No. 2741A, 0.18 miles of FDR No. 2741x, and 2.9 miles of FDR No. 150 (Government Mountain Road). Chicago Peak Road (FDR No. 2741) would remain open. These road closures would need to be completed prior to mine construction and development. KNF and the USFWS would evaluate the potential of and need for additional road and trail closures associated with the 2,350 acres of lands acquired by Sterling to maintain habitat effectiveness as those lands were acquired. KNF would also monitor recreational use on the Rock Lake and St. Paul Lake trails to assure use levels do not exceed the "high use" designation.

Sterling would be required to finalize a monitoring plan to ascertain the effectiveness of the various mitigations on grizzly bears and their habitat. Sterling would:

- monitor or fund the cost of monitoring the effectiveness of road and trail closures described above and included in the Wildlife Monitoring Plan;
- fund the cost of radio telemetry monitoring of grizzly bears in the lower Cabinet Mountains by the USFWS;
- document the number of road kills on project-related roads and any use of those kills by grizzly bears; and
- monitor and report within 24 hours all grizzly bear, bald eagle, lynx, and wolf mortalities within the permit area.

Sterling would establish a trust fund and/or post a bond, prior to initiating any activities, to cover the mitigation plan implementation costs. The amount in the fund or posted in a bond would be commensurate with projected work and associated mitigation items. See the revised T&E mitigation plan in the BA for more detail.

As soon as DEQ permits and KNF approvals are obtained, if the agencies decide to approve the proposed action, Sterling would need to enter into a Memorandum of Understanding/Agreement with the USFWS, the USFS, MDFWP, and other applicable agencies to specify when all components of this plan will be finalized and implemented as required by the Reasonable and Prudent Alternative and the Reasonable and Prudent Measures in the BO for grizzly bears. The MOU would establish roles and responsibilities of all participants and outline their commitments. The MOU would also set timelines for development of access management plans, describe the process for approving mitigation land, specify the wording for conservation easements, provide the framework for any proposed land exchanges related to mitigation acres, and outline job descriptions and work tasks for the two MDFWP positions.

Aquatics and Fisheries Monitoring and Mitigation Plans*. A mitigation plan would be required to address remaining populations of threatened and sensitive aquatic species. Under the Reasonable and Prudent Measures and Terms and Conditions sections of the BO for bull trout Sterling would be required to conduct a watershed assessment to

- better define bull trout populations (distribution, densities, age class structures, growth rates, fecundity, and status of resident and migratory populations), and
- better define habitat conditions (spawning, rearing and overwintering conditions, including temperature monitoring).

Under the terms and conditions of the BO for bull trout, Sterling would also be required to implement a stream habitat enhancement program to improve the ability of bull trout to move throughout the year in Rock Creek and increase habitat availability and diversity for migratory and resident bull trout populations. Whenever possible these mitigations should be coordinated with work being done by Avista or the local watershed council to avoid duplication of efforts.

A mitigation plan would be required to reduce sediment in spawning gravels. Sediment source reduction activities would be completed prior to the mine construction period and maintained throughout the life of the mine. Sterling would be responsible for

- identifying sediment sources within the Rock Creek watershed such as culverts, road impacts, bridges, past bank stabilization efforts, and utility right-of-way impacts.
- working with the KNF to complete a road systems analysis to define existing and future road uses and closures.
- developing a plan to reduce 400 tons of sediment per year within and outside of the permit area in the Rock Creek drainage, upstream of spawning areas, and during or prior to mine construction. The sediment source reduction plan would need to incorporate additional items (see the Erosion and Sediment Control section above for more detail). The plan would also include measures to improve in-stream sediment transport such that streambed scouring and sediment storage would be enhanced. This strategy will also result in the development of pools and stable riffles; therefore increasing habitats for fish and macroinvertebrates. A sediment monitoring program would be implemented throughout the life of the mine to ensure the sediment reduction mitigations were effective and to determine the actual effect of the project and mitigation activities on sediment levels in the drainage.
- leaving an unaltered vegetation zone between Rock Creek and the road and utility corridors, where possible during new construction, to protect bull and westslope cutthroat trout habitat; and
- installing sediment catchment basins in road ditches in areas where fine sediments could be transported to streams from application of sand during winter.

Mitigation would also include funding for personnel (the law enforcement personnel mentioned under the Wildlife Mitigation Plan and the Threatened and Endangered Species Mitigation Plan above) to protect bull and westslope cutthroat trout through enforcing the law and informing and educating the public. Angling pressure in Rock Creek and it tributaries would likely increase due to improved access and increased use. Bull trout harvest is not allowed, but the fish is often misidentified by the public. Westslope cutthroat trout are highly susceptible to angling, therefore, harvest rate information and protection are needed.

The BO for bull trout also includes two additional reasonable and prudent measures to be implemented prior to mine construction. The first would require Sterling to submit an evaluation of operational options of the proposed diffuser at the proposed location and alternate sites below the Noxon dam. The agencies and the USFWS would review the report to determine if additional recommendations could be implemented, including a possible relocation of the diffuser, that would further minimize potential impacts to migratory or resident bull trout using the Clark Fork River habitats adjacent to the mouth of Rock Creek and the spring area immediately upstream. The second would require Sterling to submit a risk assessment of potential accidents related to haul routes for mine-related risks to bull trout and make recommendations for additional measures to minimize the risk.

A conceptual monitoring plan is found in Appendix K of the final EIS. Sterling would be required to monitor impacts to benthic macroinvertebrates, fish populations, and periphyton. Metals accumulations in fish tissues and sediments, and increases in sediment loads would also be monitored. Additional monitoring sites would be required. Monitoring of sediment sources during construction would be conducted under the Reclamation Monitoring Plan found in Appendix K of the final EIS.

To ensure that withdrawal of ground water does not reduce the quantity of surface water, springs would be periodically monitored as specified in the Water Resource Monitoring Plan in Appendix K of the final EIS. For similar reasons, the flow of Rock Creek at its mouth would be continuously monitored. Additional water quality monitoring in Rock Creek and in the Clark Fork River would be done as required by the MDPES permit and the

Water Resources Monitoring Plan, as described in Appendices D and K of the final EIS respectively. Additional ground water monitoring may be necessary to comply with the terms and conditions for implementing the Reasonable and Prudent Measures in the bull trout Biological Opinion and would be incorporated into the appropriate monitoring plans as needed.

Hard-Rock Mining Impact Plan. Because the demands for local government services created by the project would not coincide with the boundaries of the affected local government districts, and because the tax revenue from the project would be generated too late to allow local government entities to respond in a timely fashion to the increased demand for their services resulting from mine construction and startup, the Montana Hard-Rock Mining Impact Act requires preparation of a Hard-Rock Mining Impact Plan. ASARCO completed this plan in coordination with Sanders County and other affected jurisdictions (ASARCO Incorporated 1997a) and the plan was approved by Sanders County on October 21, 1997. Sterling has agreed to all provisions in the plan. The plan provides a coordinated mechanism for allocating project tax revenues to local government jurisdictions that would experience increased capital and operating costs but not receive appropriate project tax revenues. It also calls for prepayment of selected local taxes where revenues would lag behind demands on local government services.

The impact plan forecasts project-induced increases in operating revenues, and net operating costs for 19 affected local government jurisdictions. Under the plan, an estimated total of $725,000 in tax pre-payments would be made during project construction and startup. These prepayments would be treated as credits against Sterling=s future local tax liabilities. In addition, special grant payments (estimated $158,500) would be made to alleviate inequities in location and timing of local government receipts. The plan includes conditions that would trigger adjustments or amendments to the plan if impacts prove to be greater than expected.

Wetlands Mitigation Plan. Sterling has identified about 18.9 acres of higher terraces, benches, and abandoned channels that are typically above the water table and located along Miller Gulch, Rock Creek, and the Clark Fork River that would be suitable for the development of linear wetlands. Of this 7 acres have been proposed for mitigation. Optional mitigation sites in six areas have also been identified for use should the proposed sites prove unfeasible, if the projected created wetlands fail to meet the proposed goals of any of the sites, or if the COE require additional mitigation beyond a 1:1 replacement ratio. Plans for the optional sites have not been prepared but would involve similar designs to those described below but modified to best suit the characteristics of each site. The mitigation sites would be developed for wetland establishment by excavating the sites, topsoiling, and planting appropriate wetland vegetation species. Whenever possible, soils taken from impacted wetlands would be used. These sites would be constructed during evaluation adit and project construction to allow the maximum amount of time for stabilization and any required modifications to achieve that prior to mine closure and reclamation (see Table 6). Detailed descriptions, including site development and design specifications, can be found in Sterling=s Wetland Mitigation Plan for Alternative V (ASARCO Incorporated 1997b); pertinent details and aspects of the plan are provided in Appendix L of the final EIS. The primary functions and values of the created wetlands would be to reestablish diversity and abundance of habitat for aquatic and terrestrial species, reduce sediment transport to Rock Creek and Miller Gulch, and attenuate peak flows.

The Miller Gulch wetland mitigation sites would consist of a series of linear wetlands created along a side drainage to the South Fork of Miller Gulch. This side drainage currently does not contain wetlands but may be similar in size to other nearby drainages that do support wetlands. Establishment of wetland hydrology in the side drainage would rely on flow barriers designed to retain surface water runoff and thus increase the duration of saturation and inundation. These mitigation wetlands likely would be inundated during similar periods of the year as those created along FDR No. 150.

Small retention dikes would be constructed at approximately 200-foot intervals along the full length of the side drainage of Miller Gulch. The dikes would be 30 to 50 feet long and a maximum of 5 feet high. Each dike would contain a rock-lined spillway. If the saturated hydraulic conductivity of the soil and substrate was greater than 2.8×10^{-4} ft/day, a clay sealant or PVC liner would be used. Hydric soils from the impacted wetland areas of Miller Gulch would be salvaged and directly respread on the mitigation sites to provide increased organic matter and a plant materials source. The sites would be broadcast seeded with a forested wetland mixture and trees and shrubs planted. Straw mulch would be applied. The primary wetland functions of the proposed Miller Gulch created wetlands would be to reduce sediment transport, increase aquatic and terrestrial habitat diversity and abundance, and attenuate peak flows.

The upper Rock Creek wetland mitigation site is located on the east side of Rock Creek near mile post 3, north of the confluence of Rock Creek with Engle Creek. The wetlands would be constructed in the streamside terrace with the wetland hydrology provided by ground water. Trees and shrubs would be removed from the site and topsoil stockpiled in non-wetland areas adjacent to the site. Linear channels would be excavated down to ground water depths, estimated at 6 to 8 feet below the surface. The width of the bottom of the linear channels would vary from 10 to 25 feet. Benches, 6 to 12 inches tall, would be constructed on one or both sides of the bottom to create zones with variable periods of saturation or inundation. Side slopes would vary reflecting excavation depth and adjacent natural topography. In general, one side of the excavation would be relatively steep (40 to 50 percent) with the opposite side constructed at a gentle to moderate slope (10 to 40 percent).

The lower Rock Creek site is located on a gently sloping toe-slope and bench primarily between FDR No. 150 and Rock Creek just opposite the road leading to the paste plant and northwest from the water treatment plant.

TABLE 6
Available Acreage and Schedule for Created Wetlands for Alternative V

Wetland Mitigation Sites	Created Acreage	Mitigation Site Construction[1]	Projected Resumption of Comparable Functions
Miller Gulch Tributary	1.2	Preproduction Year 3	Production Year 22[3]
Lower Rock Creek	1.4	Preproduction Year 5	Production Year 3
Upper Rock Creek			
Stage 1[2]	1.1	Preproduction Year 1	Preproduction Year 4
Stage 2	3.3	Preproduction Year 3	Production Year 1
Six Optional Wetland Mitigation Sites:			
Upper Rock Creek Extension	1.6	Preproduction Year 3	Production Year 1
Miller Gulch Tributary Extension	1.0	Preproduction Year 5	Production Year 3
Lower Rock Creek Extension	0.3	Preproduction Year 5	Production Year 3
Access Road	3.0+	Preproduction Year 1	Production Year 4
Middle Rock Creek	1.0	Preproduction Year 3	Production Year 1
Clark Fork River Bench	5.0+	Preproduction Year 3	Production Year 1
TOTAL WETLAND CREATION	**18.9**		

Notes:
1 Schedule based on 5 years preproduction activity, 25-30 years production, and 5 years post-production closure and reclamation.
2 Upper Rock Creek Stage 1 will involve 1.1 acres of mitigation. Stage 2 will include the remaining 3.3 acres and will address any changes necessary based on results of Stage 1 mitigation.
3 This mitigation site is proposed as a forested wetland and 25 years are projected to allow trees to develop to provide comparable functions as disturbed forested wetlands.

A small segment would be located west of the road. The site includes a portion of the area designated as Borrow Area 3. Alternative V does not incorporate the use of borrow from this site at the tailings disposal site; however, if the final tailings paste disposal design changes that requirement, the wetland mitigation design would be modified to account for any topographic changes. After tree and shrub removal and soil salvage and storage had taken place, linear channels would be excavated to a depth of 2 to 3 feet with variable widths between 10 and 25 feet. Side slopes would vary between 50 and 20 percent. Small depressions would be constructed along the longitudinal profile of each channel to increase water retention. If necessary, small flow barriers (detention dikes) similar to those proposed for the Miller Gulch tributary mitigation site would be constructed across the channel to create additional diversity in wetland hydrology by creating longer periods of inundation or saturation upstream of the dike. If scouring occurred at the outlet of the channels, rock energy dissipators would be constructed.

The Rock Creek mitigation sites would be topsoiled with 12 to 13 inches of salvaged soil. The sites would be revegetated with a herbaceous revegetation mix. Channel side slopes and any berms created with excavated materials would be seeded with the project's standard upland herbaceous mix. Since the narrow configuration of the

Mitigation sites would preclude effective drill seeding, the sites would be broadcast seeded. The sites would then be mulched with noxious weed-free straw (2,000 pounds/acre) or cellulose fiber hydromulch (1,500 pounds/acre). Wetland functions of the proposed upper and lower Rock Creek constructed wetlands would be to enhance ground water recharge and discharge and increase aquatic and wildlife habitat diversity and abundance.

A plan, required by COE as part of the 404 permit, would be developed to mitigate impacts to wetlands associated with Cliff and Copper lakes if subsidence should cause the lakes to drain. An aquatic life mitigation plan would be prepared in conjunction with the wetlands mitigation plan for wilderness lakes.

A monitoring plan using standardized wetland assessment techniques for determining wetland functions and values would be performed to monitor impacts to wetlands and non-wetland waters of the U.S. during mining and to evaluate the success of re-establishing the functions and values at the wetlands mitigation sites.

Appendix B
Grizzly Bear Mortality Table

Appendix B. Grizzly bear mortality in or near the Cabinet-Yaak recovery zone, 1950-99.

YEAR	LOCATION	TOTAL	SEX / AGE	MORTALITY CAUSE
1950	SQUAW CR	1	SUBADULT	UNKNOWN
1951	PETE CR	1	ADULT MALE	NUISANCE
1951	PAPOOSE CR	2	SUBADULTS	UNKNOWN
1951	GOAT CR	1	SUBADULT MALE	UNKNOWN
1952	FELIX CR	6	2 ADULT FEMALES, 4 YEARLINGS	NUISANCE
1953	OBRIEN CR	1	SUBADULT MALE	HUNTER KILL
1953	KENELTY MT	1	UNKNOWN	HUNTER KILL
1953	20-ODD MT	1	UNKNOWN	HUNTER KILL
1953	BURNT CR	1	UNKNOWN	HUNTER KILL
1953	17-MILE CR	1	UNKNOWN	HUNTER KILL
1954	N F BULL R	1	UNKNOWN	HUNTER KILL
1954	S F BULL R	1	UNKNOWN	HUNTER KILL
1954	CEDAR LK	1	UNKNOWN	HUNTER KILL
1954	CEDAR LK	1	UNKNOWN	HUNTER KILL
1954	TAYLOR PK	1	UNKNOWN	HUNTER KILL
1954	SILVERBUTTE CR	1	UNKNOWN	HUNTER KILL
1954	SILVERBOW CR	1	ADULT FEMALE	HUNTER KILL
1955	WOLF CR [1]	1	ADULT MALE	MANAGEMENT REMOVAL
1955	MT HEADLEY	1	SUBADULT	NUISANCE
1955	BAREE LK	1	ADULT MALE	UNKNOWN
1955	BAREE LK	1	ADULT FEMALE	UNKNOWN
1955	BEAR CR	1	SUBADULT MALE	HUNTER KILL
1958	SQUAW CR	1	ADULT FEMALE	NUISANCE
1959	E F ROCK CR	2	ADULT FEMALE, 1 CUB	HUNTER KILL
1959	W F THOMPSON R	4	ADULT FEMALE, 3 CUBS	UNKNOWN
1959	CLIFF CR	1	UNKNOWN	UNKNOWN
1960	PROSPECT CR [1]	2	ADULT FEMALE, 1 CUB	UNKNOWN
1964	GRAVES CR	2	SUBADULTS	UNKNOWN
1964	WANLESS LK	3	SUBADULTS (ADULT WOUNDED)	UNKNOWN
1965	SNOWSHOE CR	2	SUBADULTS	UNKNOWN
1965	PINKHAM CR [1]	1	UNKNOWN	UNKNOWN
1967	SOPHIE LK [1]	1	UNKNOWN	UNKNOWN
1968	BEAR CR	1	ADULT FEMALE	ILLEGAL KILL
1968	GRANITE CR	1	SUBADULT MALE	NUISANCE
1969	PRISCILLA PK	1	ADULT FEMALE	UNKNOWN
1970	THOMPSON R	1	UNKNOWN	UNKNOWN
1970	CAMERON CR	1	SUBADULT MALE	UNKNOWN
1970	SQUAW CR	2	ADULT FEMALE, SUBADULT FEMALE	NUISANCE
1971	MURR CR [1]	1	ADULT FEMALE	UNKNOWN
1972	ROCK CR	1	SUBADULT	MISTAKEN IDENTITY (Black Bear)
1974	SWAMP CR	1	ADULT MALE	HUNTER KILL
1977	RABBIT CR	1	ADULT MALE	UNKNOWN
1982	GROUSE	1	ADULT MALE	ILLEGAL KILL
1984	HARVEY CR	1	UNKNOWN	MISTAKEN IDENTITY (Black Bear)
1985	LYONS CR	1	ADULT MALE	DEFENSE OF LIFE
1986	BURNT CR	1	CUB	UNKNOWN
1987	FLATTAIL CR	1	FEMALE CUB	MISTAKEN IDENTITY (Elk)
1988	LEWISBY CR, BC [1]	1	ADULT MALE	HUNTER KILL (BC)
1988	N F 17-MILE CR	1	ADULT FEMALE	DEFENSE OF LIFE
1989	BURNT CR	1	SUBADULT FEMALE	TRAP MORTALITY (PREDATION)
1990	POVERTY CR	1	SUBADULT MALE	UNKNOWN
1992	TRAIL CR	1	UNKNOWN	UNKNOWN
1993	LIBBY CR	2	ADULT FEMALE AND CUB	UNKNOWN
1996	DODGE CR	1	SUBADULT MALE	UNDER INVESTIGATION (Illegal)
1996	GOLD CR, BC [1]	1	ADULT MALE	UNDER INVESTIGATION (Illegal)
1999	17 MILE CR	3	ADULT FEMALE, 2 CUBS	NATURAL MORTALITY (Predation)
1999	W FK YAHK R, BC	1	SUBADULT FEMALE	DEFENSE OF LIFE
1999	EFK YAAK R	1	ADULT MALE	MANAGEMENT REMOVAL

[1] Occurred more than 10 miles outside the recovery zone.

Appendix C
Terrestrial Threatened and Endangered Species Mitigation Plan for the Proposed Sterling Rock Creek Mine

This mitigation plan displays the specific items identified that are required to reduce, eliminate, or provide substitution for environmental consequences to species federally listed as threatened or endangered. It covers implementing alternative five as displayed in the final environmental impact statement for the STERLING Rock Creek Mine project and supports requirements from the U.S. Fish and Wildlife Service Biological Opinion. This mitigation plan will be implemented by STERLING and appropriate state and federal agencies. Timing of completion of this plan is tied to three phases of mine activity (evaluation adit – requires letter to proceed, construction – requires letter to proceed, operation – estimated to be 5 years after construction starts).

A. To reduce mortality risk (avoid incidental take) to Threatened and Endangered species STERLING will:

1. Develop a transportation plan designed to minimize mine related vehicular traffic, traveling between state highway 200 and the mill site, and minimize parking availability at the plant site. Busing employees to the mill site will be a part of the plan. Forest Service approval required. The plan will be in place prior to starting the evaluation adit.

2. Not use salt when sanding during winter plowing operations, on Forest Development Road 150 (FDR-150), to reduce big game mortality that could draw bald eagles, wolves and grizzly (in spring) to the road corridor and increase mortality.

3. Daily remove vehicular killed deer and elk from road rights-of-way within the permit area and along roadways used for access or hauling ore (FDR 150, 150A and new roads built for the project). Road kills would be moved at least 50 feet beyond the right-of-way clearing and further if necessary to be out of sight from the road. During construction and the first three years of full operation, STERLING would monitor the number of vehicular killed deer and elk on these roads and report findings annually. They would also monitor and report (within 24 hours) all grizzly bear, bald eagle, lynx and wolf mortalities within the permit area. If a T&E species mortality occurs, and it is determined that the carrion was a contributing factor, then STERLING would start hauling the dead deer and elk to a dumping location approved by Montana Fish, Wildlife and Parks (MFWP). After five years of full operation the Forest Service, in consultation with the U.S. Fish and Wildlife Service, will do a reevaluation of mortality risk to bald eagles, wolf, and grizzly bear to determine the need to continue this mitigation measure.

4. Construct power lines following criteria outlined by Olendorff, Miller and Lehman (1981) to reduce potential for electrocution of bald eagles.

5. Work with other mines permitted to operate in the area (ie. Montanore) to fund a MFWP grizzly bear management specialist (with focus on public information and education) position (estimated at State grade 14) to aid in grizzly bear conservation. This would be the same position as required in the Record of Decision for the Montanore Project (9/93), not an additional one. The position would be funded for 3 years and in place prior to starting the evaluation adit, and then evaluated for need to continue as is or modify to better benefit the grizzly. Funding would be provided prior to starting the evaluation adit to cover the first 3 years. The position would be stationed either in the lower Clark Fork valley or the Libby area. If for some reason the Montanore project does not proceed, STERLING will be responsible to fully fund the position. The purposes are to reduce mortality risk through (1) education of the public on the law and penalty for violation (illegal killing of T&E species); (2) education of hunters on bear identification to reduce accidental killing of grizzly and (3) educate the public on biological needs of the grizzly so that an understanding exists that reduces "social jeopardy" and 4) educates the public on storage of human and pet (animal) food in bear habitat to prevent and correct sanitation problems. The position description and an initial list of work items will be developed jointly by the agencies (including but not limited to Forest Service, U.S. Fish and Wildlife Service, Montana Fish, Wildlife and Parks) and Sterling representatives.

6. Work with other mines operating in the area (ie. Montanore) to fund a local MFWP law enforcement position (estimated at State grade 14) for the life of the mine. This would be the same position as required in the Record of Decision for the Montanore Project (9/93), not an additional one. The position would be stationed in the lower Clark Fork valley. If for some reason the Montanore project does not proceed, STERLING will be responsible to fully fund the position. The program would be funded for 3 years and in place prior to starting the evaluation adit, and then evaluated for need to continue as is or modify to better benefit the grizzly. The position description and an initial list of work items will be developed jointly by the agencies (including but not limited to Forest Service, U.S. Fish and Wildlife Service, Montana Fish, Wildlife and Parks) and Sterling representatives.

7. Use bear-proof containers to hold attractants and remove them in a timely manner (weekly unless a problem develops, then daily) at all Rock Creek facilities. Containers will be in place at each mine facility site prior to starting any work on each site.

8. Not use clover or other preferred bear food plants in the seed mix used on any disturbed area, to reduce grizzly/human encounters caused by bears being drawn to clover sites.

9. Prohibit employees from carrying firearms within the permit area, except for security officers and other designated personnel.

10. Exhibit employees from feeding wildlife, especially bears, as food becomes attractants to bears.

11. Fund the acquisition of bear proof garbage containers to be placed in all developed campgrounds within Bear Management Units 4, 5 and 6 (Bull River and Howard Lake campgrounds; Lake Creek campground is a pack in/pack out site and will not require garbage containers).

12. Require mine employees to attend training related to living and working in grizzly bear habitat prior to starting work and on an annual basis thereafter or as scheduled by the grizzly bear management specialist.

B. To maintain habitat effectiveness for Threatened and Endangered species, STERLING will:

1. Secure or protect (through conservation easement, including road closures, or acquisition in fee with restrictive covenants) from development (including but not limited to housing, motorized access) and use (timber harvest, adverse grazing, mining) replacement habitat to compensate for acres lost by physical alterations, or acres with reduced habitat availability due to disturbance. Replacement acres for Alternative Five are: 2350. The "in kind" replacement acres must provide 2.61 early (6133.5 total), 1.61 late (3783.5 total) for an overall 2.11 habitat unit value (4958.5 total overall HUs). Replacement habitat will be provided using the following schedule:

Activity Area	Replacement Acres	Timing
Exploration Adit	53	Prior to Eval. Adit
Tailings & AF	806	Prior to Construction
Mill & AF	248	Prior to Construction
Ventilation Adit	10	Prior to Construction
New Roads	102	Prior to Construction
Existing Roads (Reconstruction)	565	Prior to Construction
Existing Roads (Increased Influence)	566	Prior to Operations
Total Alternative 5	2350	Prior to Operations

AF = Associated Features

This schedule will have all replacement habitat (except ventilation adit) in place prior to starting full operations (end of year 5). Replacement habitat to the ventilation adit will be in place prior to construction, if the adit becomes necessary.

Either fee title or conservation easements are acceptable. Fee lands must be protected by a restrictive covenant that ensures protection in perpetuity while in private ownership. Conservation easements will be in perpetuity and transferred to the Forest Service. Fee title lands may be considered for donation or land exchange with the Forest Service. Costs of processing land exchanges, and preparing and accepting conservation easement by the Forest Service for these acres will be funded by Sterling. Land exchanges would be for equal valued lands as determined by a federal land appraisal. Any exchange must be beneficial to the Forest Service. All land interest conveyed to the Forest Service must be acceptable and approved by the Office of General Counsel. Fee title land must be conveyed by Warranty Deed in accordance with Department of Justice standards. Conservation easement s must be prepared and conveyed in accordance with Department of Justice standards. All property, or interest in property, shall be inspected for hazardous substances in accordance with law, regulation and policy. If hazardous substance are found an agreement needs to be reached on removal and remedial action. First choice for replacement habitat is within the disturbed BMUs (4,5,6). If adequate replacement acres are not available in those BMUs then acres may be found in other BMUs (7 & 8) within the southern portion of the Cabinet Mountains. See the Replacement Habitat Assessment for acceptable lands to consider **(Not available to public until replacement habitat mitigation completed).**

Forest Service and US Fish and Wildlife Service will have final approval of mitigation acres and associated covenants prior to recording.

2. Fund habitat enhancement, commensurate with loss of habitat effectiveness. Enhancements include, but are not limited to, prescribed fire to restore whitebark pine, road closures and obliterations. Enhancements are preferred in the affected BMUs, however if opportunities are not available, then work may be done in BMUs in the southern portion of the Cabinet Mountains. Generally enhancements would occur in relation to replacement habitat acres. Enhancements associated with replacement acres will occur in a timely manner as agreed to by the agencies.

BMU	% H.E. Change	Acres H.E. Mitigation
4	+ 1.0	0
5	- 1.1	348
6	- 0.3	136

C. To reduce mortality risk, maintain habitat effectiveness, reduce incidental take and avoid jeopardy for Threatened and Endangered species the Kootenai National Forest, with STERLING funds, will:

1. Close the following roads prior to the start of construction phase (see maps):

Road Number	Road Name	Closure Miles	Closure Period	Closure Method
2285	Orr Creek	1.61	Yearlong	Barrier
2741X	unnamed	0.18	Yearlong	Barrier
2741A	unnamed	0.51	Yearlong	Barrier
150	Rock Creek	2.92	Yearlong	Gate *

* 2.5 miles gated (south end), 0.42 miles obliterated (north end) - see map

2. Implement a food storage order for Bear Management Units 4, 5 and 6 prior to allowing Sterling to start the evaluation adit.

3. Monitor use on the Rock Lake and St Paul Lake trails to assure use levels do not exceed "high use" as defined by the IGBC. A recreational use management plan will be developed to assure high use does not occur. The plan will be implemented when monitoring indicates high use has occurred during one bear season. The plan will be prepared within 3 years of the signature date on the Record of Decision and must be signed by the involved agencies (Forest Service, US Fish & Wildlife Service).

D. To address habitat constriction which reduces the potential to achieve CYE grizzly bear recovery goals (by impacting individuals in the Cabinet Mountains) and to avoid Jeopardy, STERLING will:

1. Secure or protect (through conservation easement, including road closures or acquisition in fee with restrictive covenants) from development (including but not limited to housing, motorized access) and use (mining, timber harvest, adverse grazing) 100 acres of replacement habitat that will enhance the north to south habitat corridor in the Cabinet Mountains. These lands are in addition to those identified under mitigation item B-1. A total of 53 acres of replacement habitat will be secured prior to starting the evaluation adit, with the remainder prior to construction phase. These acres must be approved by the agencies. See the Corridor Replacement Habitat Assessment for acceptable lands to consider **(Not available to public until corridor replacement habitat mitigation completed)** Either fee title or conservation easements are acceptable. Conservation easements would be in perpetuity and transferred to the Forest Service. Fee title lands within the corridor would be placed in public ownership either through donation or land exchange. Costs of processing land exchanges, and preparing and accepting conservation easement by the Forest Service for these acres will be funded by Sterling. Land exchanges would be for equal valued lands as determined by a federal land appraisal. Any exchange must be beneficial to the Forest Service. All land interest conveyed to the Forest Service must be acceptable and approved by the Office of General Counsel. Fee title land must be conveyed by Warranty Deed in accordance with Department of Justice standards. Conservation easement s must be prepared and conveyed in accordance with Department of Justice standards. All property, or interest in property, shall be inspected for hazardous

substances in accordance with law, regulation and policy. If hazardous substance are found an agreement needs to be reached on removal and remedial action.

E. To assure compliance with the T&E species mitigation plan, and effectiveness of the management plan STERLING will:

1. Establish a trust fund and/or post a bond, prior to initiating any activities, to cover the mitigation plan implementation costs. The amount in the fund or posted in a bond will be commensurate with projected work and associated required mitigation items (see table below). Initial cost estimates; in year 2000 dollars are about $7.66 million over the life of the mine. Actual amount will be adjusted for inflation.

Estimated Deposit Summary:

Year	Deposit/Bond
1	$ 1,282,300
5	$ 2,128,200
15	$ 4,250,000

2. Participate in the development of and be a signer on a Memorandum of Understanding that establishes the roles and responsibilities of all participants (agencies and company).

   a. outlines the commitments of the signing parties.
   b. sets timelines for development of access management plans related to mitigation acres.
   c. describes the process for approving mitigation lands.
   d. specifies wording for conservation easements and other restrictive covenants on fee lands.
   e. provides framework for any proposed land exchanges related to mitigation acres.
   f. outlines job descriptions and work tasks for the two Montana Fish, Wildlife and Parks positions.

3. Contribute funding to support radio telemetry monitoring of bear movements in the Southern Cabinet Mountains to confirm the effectiveness of mitigation measures implemented to provide a secure north to south movement corridor. Funding to support monitoring would start when the U.S. Forest Service issues the letter to proceed with the evaluation adit. Funding would continue through mine life, whether that be at the end of the evaluation adit reclamation or full mine development.

Appendix D
Maps of Mining Activities in Rock Creek

Appendix E.
Map of Status of Bull Trout in the Kootenai River Basin