# Montana Bureau of Mines and Geology
# Abandoned-Inactive Mines of the
# Kootenai National Forest-Administered Land

*Crew of hardy miners, Snowshoe gulch, 1897. (Photo courtesy, Mrs. Sam Ratekin.)*

## MBMG 395


Phyllis A. Hargrave
Alan R. English
Mike D. Kerschen
Geno W. Liva
Jeffrey D. Lonn
James P. Madison
John J. Metesh
Robert Wintergerst



**Prepared for the U.S. Department of Agriculture**
**Forest Service-Region 1**

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## Open-File Report
## MBMG 395

## December 1999


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by
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## Contents

## List of Figures

## List of Tables

## List of Appendixes

# Introduction

To fulfill its obligations under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Northern Region of the U. S. Forest Service (USFS) desires to identify and characterize the abandoned and inactive mines with environmental, health, and/or safety problems that are on or affecting National Forest System lands. The Northern Region of the USFS administers National Forest System lands in Montana and parts of Idaho and North Dakota. Concurrently, the Montana Bureau of Mines and Geology (MBMG) collects and distributes information about the geology, mineral resources, and ground water of Montana. Consequently, the USFS and the MBMG determined that an inventory and preliminary characterization of abandoned and inactive mines in Montana would be beneficial to both agencies and entered into a series of participating agreements to accomplish this work. The first forest inventoried was the Deerlodge National Forest. The results of this inventory are presented in five volumes with the MBMG open-file report (OFR) numbers following the title: Volume I-Basin Creek (OFR 321), Volume II-Cataract Creek (OFR 344), Volume III-Flint Creek and Rock Creek (OFR 345), Volume IV-Upper Clark Fork River (OFR 346), and Volume V-Jefferson River (OFR 347). The second forest inventoried was the Helena National Forest. The results of this inventory are presented in Volume I-Upper Missouri River (OFR 352), and Volume II-Blackfoot and Little Blackfoot Rivers (OFR 368). The third Forest inventoried was the Beaverhead National Forest with the results presented in 1998's MBMG OFR 379. The inventories of abandoned mines in the Kootenai, and the Lewis and Clark National Forests were begun in 1997 and completed in 1998. Sites on U.S. Bureau of Land Management-(BLM) administered land are described in MBMG OFR 365.

## 1.1 Project Objectives

In 1992, the USFS and MBMG entered into the first of these agreements to identify and characterize abandoned and inactive mines on or affecting National Forest System lands in Montana. The objectives of this discovery process, as defined by the USFS, were to

1. Utilize a formal, systematic program to identify the "Universe" of sites with possible human health, environmental, and/or safety-related problems that are either on or affecting National Forest System lands.

2. Identify the human health and environmental risks at each site based on site characterization factors, including screening-level soil and water data that have been taken and analyzed in accordance with EPA quality-control procedures.

3. Based on site-characterization factors, including screening-level sample data where appropriate, identify those sites that are not affecting National Forest System lands, and can therefore be eliminated from further consideration.

4. Cooperate with other state and federal agencies, and integrate the Northern Region

program with their programs.

5. Develop and maintain a data file of site information that will allow the region to pro-actively respond to governmental and public interest group concerns.

In addition to the USFS objectives, the MBMG objectives also included gathering new information on the economic geology and hydrogeology associated with these abandoned and inactive mines. Enacted by the Legislative Assembly of the State of Montana (Section 75-607, R.C.M., 1947, Amended), the scope and duties of the MBMG include, "the collection, compilation, and publication of information on Montana's geology, mining, milling, and smelting operations, and ground-water resources; investigations of Montana geology emphasizing economic mineral resources and ground-water quality and quantity."

### 1.2 Abandoned and Inactive Mines Defined

For the purposes of this study, mines, mills, or other processing facilities related to mineral extraction and/or processing are defined as abandoned or inactive as follows:

> A mine is considered abandoned if there are no identifiable owners or operators for the facilities, or if the facilities have reverted to federal ownership.
>
> A mine is considered to be inactive if there is an identifiable owner or operator of the facility, but the facility is not currently operating, and there are no approved authorizations or permits to operate.

### 1.3 Health and Environmental Problems at Mines

Abandoned and inactive mines may host various safety, health, and environmental problems that may include metals that contaminate ground water, surface water, and soils; airborne dust from abandoned tailings impoundments; sedimentation in surface waters from eroding mine and mill waste; unstable waste piles with the potential for catastrophic failure; and physical hazards associated with mine openings and dilapidated structures. Although all problems were examined at least visually (appendix I-Field Form), the hydrologic environment appears to be affected to the greatest extent. Therefore, this investigation focused most heavily on impacts to surface and ground water from the mines.

Metals are often transported from a mine by water (ground-water or surface-water runoff), either by being dissolved, suspended, or carried as part of the bedload. When sulfides are present, acid can form, which in turn increases the metal solubility. This condition, known as acid-mine drainage (AMD), is a significant source of metal releases at many of the mine sites in Montana.

### 1.3.1 Acid-Mine Drainage

Trexler and others (1975) identified six components that govern the formation of metal-laden acid-mine waters. They are as follows:

1) availability of sulfides, especially pyrite,
2) presence of oxygen,
3) water in the atmosphere,
4) availability of leachable metals,
5) availability of water to transport the dissolved constituents, and
6) mine characteristics that affect the other five elements.

Most geochemists would add to this list mineral availability, such as calcite, which can neutralize the acidity. These six components occur not only within the mines but can exist within mine dumps and mill-tailings piles making waste material sources of contamination as well.

Acid-mine drainage is formed by the oxidation and dissolution of sulfides, particularly pyrite ($FeS_2$) and pyrrhotite ($Fe_{1-x}S$). Other sulfides play a minor role in acid generation. Oxidation of iron sulfides forms sulfuric acid ($H_2SO_4$), sulfate ($SO_4^{=}$), and reduced iron ($Fe^{2+}$). Mining of sulfide-bearing rock exposes the sulfide minerals to atmospheric oxygen and oxygen-bearing water. Consequently, the sulfide minerals are oxidized, and acid-mine waters are produced.

The rate-limiting step of acid formation is the oxidation of the reduced iron. This oxidation rate can be greatly increased by iron-oxidizing bacteria (*Thiobacillus ferrooxidans*). The oxidized iron produced by biological activity is able to promote further oxidation and dissolution of pyrite, pyrrhotite, and marcasite ($FeS_2$-a dimorph of pyrite).

Once formed, the acid can dissolve other sulfide minerals, such as arsenopyrite (FeAsS), chalcopyrite ($CuFeS_2$), galena (PbS), tetrahedrite ($[CuFe]_{12}Sb_4S_{13}$), and sphalerite ([Zn,Fe]S) to produce high concentrations of copper, lead, zinc, and other metals. Aluminum can be leached by the dissolution of aluminosilicates common in soils and waste material found in southwestern Montana. The dissolution of any given metal is controlled by the solubility of that metal.

### 1.3.2 Solubilities of Selected Metals

At a pH above 2.2, ferric hydroxide($Fe[OH]_3$) precipitates to produce a brown-orange stain in surface waters and forms a similarly colored coating on rocks in affected streams. Other metals, such as copper, lead, cadmium, zinc, and aluminum, if present in the source rock, may co-precipitate or adsorb onto the ferric hydroxide (Stumm and Morgan, 1981). Alunite ($KAl_3[SO_4]_2[OH]_6$) and jarosite ($KFe_3[SO_4]_2[OH]_6$) will precipitate at pH less than 4, depending on $SO_4^{=}$ and $K^+$ activities (Lindsay, 1979). Once the acid conditions are present, the solubility of the metal governs its fate and transport:

**Manganese** solubility is strongly controlled by the redox state of the water and is limited by several minerals such as pyrolusite and manganite; under reduced conditions, pyrolusite ($MnO_2$) is dissolved and manganite ($MnO[OH]$) is precipitated. Manganese is found in mineralized environments as rhodochrosite ($MnCO_3$) and its weathering products.

**Aluminum** solubility is most often controlled by alunite ($KAl_3[SO_4]_2[OH]_6$) or by gibbsite ($Al[OH]_3$), depending on pH. Aluminum is one of the most common elements in rock-forming minerals such as feldspars, micas, and clays.

**Silver** solubility is strongly affected by the activities of halides such as $Cl^-$, $F^-$, $Br^-$, and $I^-$. Redox and pH also affect silver solubility but to a lesser degree. Silver substitutes for other cations in common ore minerals such as tetrahedrite and galena and is found in the less common hydrothermal minerals pyrargyrite ($Ag_3SbS_2$) and proustite ($Ag_3AsS_3$).

**Arsenic** tends to precipitate and adsorb with iron at low pH, and de-sorb or dissolve at higher pH. Thus, once oxidized, arsenic will be present in solution in higher pH waters. At a pH between 3 and 7, the dominant arsenic compound is a monovalent arsenate $H_2AsO_4$. Arsenic is abundant in metallic mineral deposits as arsenopyrite (FeAsS), enargite ($Cu_3AsS_4$), and tennantite ($Cu_{12}As_4S_{13}$), to name a few.

**Cadmium** solubility data are limited. In soils, cadmium solubility is controlled by the carbonate species octavite ($CdCO_3$) at a soil-pH above 7.5 and by strengite ($Cd_3[PO_4]_2$) at a soil-pH below 6. In soils, octavite is the dominant control on solubility of cadmium. In water, at low partial pressures of $H_2S$, $CdCO_3$ is easily reduced to CdS.

**Copper** solubility in natural waters is controlled primarily by the carbonate content; malachite ($Cu_2[OH]_2CO_3$) and azurite ($Cu_3[OH]_2[CO_3]_2$) control solubility when $CO_3$ is available in sufficient concentrations. In soil, copper complexes readily with soil iron to form cupric ferrite. Other compounds in soil such as sulfate and phosphates also may control copper solubility. Copper is present in many ore minerals, including chalcopyrite ($CuFeS_2$), bornite ($Cu_5FeS_4$), chalcocite ($Cu_2S$), and tetrahedrite ($Cu_{12}Sb_4S_{13}$).

**Mercury** readily vaporizes under atmospheric conditions and thus, is most often found in concentrations well below the 25 µg/L equilibrium concentration. The most stable form of mercury in soil is its elemental form. Mercury is found in low-temperature hydrothermal ores as cinnabar (HgS), in epithermal (hot springs) deposits as native mercury (Hg), and as Hg in human-made deposits where mercury was used in the processing of gold ores.

**Lead** concentrations in natural waters are controlled by lead carbonate, which has an equilibrium concentration of 50 µg/L at a pH between 7.5 and 8.5. As with other metals, concentrations in solution increase with decreasing pH. In sulfate soils with a pH less than 6, anglesite controls solubility while cerussite, a lead carbonate, controls solubility in buffered soils. Lead occurs in the common ore mineral galena (PbS).

**Zinc** solubility is controlled by the formation of zinc hydroxide and zinc carbonate in natural waters. At a pH greater than eight, the equilibrium concentration of zinc in waters with a high bicarbonate content is less than 100 µg/L. Franklinite may control solubility at pH less than five in water and soils, and is strongly affected by sulfate concentrations. Thus, production of sulfate from AMD may ultimately control solubility of zinc in water affected by mining. Sphalerite (ZnS) is common in mineralized systems.

### 1.3.3 The Use of pH and SC to Identify Problems

In similar mine evaluation studies, pH and specific conductance (SC) have been used to distinguish "problem" mine sites from those that have no adverse water-related impacts. The general assumption is that low pH (<6.8) and high SC (variable) indicate a problem, and that neutral or higher pH and low SC indicate no problem.

Limiting data collection only to pH and SC largely ignores the various controls on solubility and can lead to erroneous conclusions. Arsenic, for example, is most mobile in waters with higher pH values (>7), and its concentration strongly depends on the presence of dissolved iron. Cadmium and lead also may exceed standards in waters having pH values within acceptable limits.

Reliance on SC as an indicator of site conditions also can lead to erroneous conclusions. The SC value of a sample represents 55 to 75% of the total dissolved solids (TDS) depending on the concentration of sulfate. Without knowing the sulfate concentration, an estimate of TDS based on SC has a 25% error range. Further, without having a "statistically significant" amount of SC data for a study area, it is hard to define what constitutes a high or low SC value.

Thus, a water sample with a near-neutral pH and a moderate SC could be interpreted to mean that no adverse impacts have occurred when one or more dissolved-metal species may exceed standards. With this in mind, the evaluation of a mine site for adverse impacts on water and soil must include the collection of samples for analysis of metals, cations, and anions.

## 1.4 Methodology

### 1.4.1 Data Sources

The MBMG began this inventory effort by completing a literature search for all known mines in Montana. The MBMG plotted the published location(s) of the mines on USFS maps. From the maps, the MBMG developed an inventory of all known mines located on or that could affect National Forest System lands in Montana. The following data sources were used:

1) the MILS (mineral industry location system) data base [U.S. Bureau of Mines(USBM)],

2) the MRDS (mineral resource data systems) data base [U.S. Geological Survey(USGS)],

4) state publications on mineral deposits,
5) USGS publications on the general geology of some quads,
6) recent USGS/USBM mineral resource potential studies of proposed wilderness areas,
7) MBMG mineral property files.

During subsequent field visits, the MBMG located numerous mines and prospects for which no previous information existed. Conversely, other mines for which data existed could not be located in the field.

### 1.4.2 Pre-Field Screening

Field crews visited only sites with the potential to release hazardous substances and sites that lacked information to make that determination without a field visit. For problems to exist, a site must have a source of hazardous substances and a method of transport from the site. Most metal mines contain a source for hazardous substances, but the common transport mechanism, water, is not always present. Sites on dry ridgetops were assumed to have no mechanism for water transport and mines described in the literature as small prospects were considered to have inconsequential hazardous-materials sources thus neither type was visited.

In addition, the MBMG and the USFS developed screening criteria (table 1) to determine if a site had the potential to release hazardous substances or posed other environmental or safety hazards. The first page of the Field Form (appendix I) contains the screening criteria. If any of the answers were “yes” or unknown, the site was visited. Personal knowledge of a site and published information were used to answer the questions. USFS mineral administrators used these criteria to "screen out" several sites using their knowledge of an area.

Table 1. Screening criteria.

| Yes | No | | |
|---|---|---|---|
| __ | __ | 1. | Mill site or tailings present |
| __ | __ | 2. | Adits with discharge or evidence of a discharge |
| __ | __ | 3. | Evidence of or strong likelihood for metal leaching or AMD (water stains, stressed or lack of vegetation, waste below water table, etc.) |
| __ | __ | 4. | Mine waste in flood plain or shows signs of water erosion |
| __ | __ | 5. | Residences, high public-use area, or environmentally sensitive area (as listed in HRS) within 200 feet of disturbance |
| __ | __ | 6. | Hazardous wastes/materials (chemical containers, explosives, etc.) |
| __ | __ | 7. | Open adits/shafts, highwalls, or hazardous structures/debris |

**If the answers to questions 1 through 6 were <u>all</u> "NO" (based on literature, personal knowledge, or site visit), then the site was not investigated further.**

Mine sites that were not visited were retained in the data base along with the data source(s) consulted (appendix II). However, often these sites were viewed from a distance while visiting another site. In this way, the accuracy of the consulted information was often verified.

Placer mines were not studied as part of this project. Although mercury was used in amalgamation, the complex nature of placer deposits makes detection of mercury difficult and is beyond the scope of this inventory. Due to their oxidized nature, placer deposits are not likely to contain other anomalous concentrations of heavy metals. Limestone and building stone quarries, gravel pits, and phosphate mines were considered to be free of anomalous concentrations of hazardous substances and were not examined.

### 1.4.3 Field Screening

Sites that could not be screened out as described above were visited. All visits were conducted in accordance with a health and safety plan that was developed for each forest. An MBMG geologist usually made the initial field visit and gathered information on environmental degradation, hazardous mine openings, presence of historical structures, and land ownership. Some site locations were refined using conventional field methods. Each site is located by latitude/longitude and by Tract-Section-Township-Range (see figure 1 for explanation).

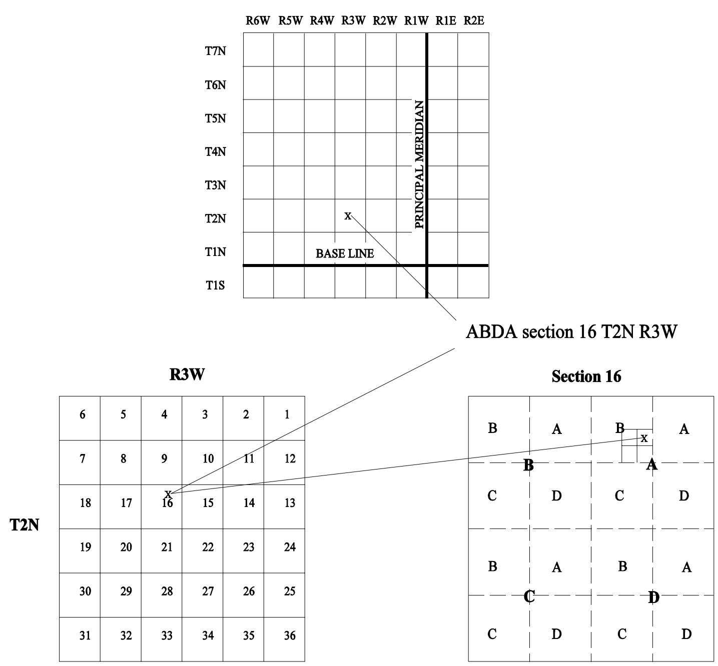


Figure 1. The location of a mine is found as shown using a counterclockwise progression of decreasing quarters of a section of land. The resulting tract in this case is ABDA.

At sites for which sparse geologic or mining data existed, MBMG geologists characterized the geology, collected samples for geochemical analysis, evaluated the deposit, and described workings and processing facilities present.

Sites with potential environmental problems were studied more extensively. The selection of these sites was made during the initial field visit using the previously developed screening criteria (table 1). In other words, if at least one of the first six screening criteria was met, the site was studied further. Sites that were not studied further are included in appendix III.

On public lands, sites with ground-water discharge, flowing surface water, or contaminated soils (as indicated by impacts on vegetation) were mapped by the geologist using a Brunton compass and tape. The maps show locations of the workings, exposed geology, dumps, tailings, surface water, and geologic sample locations.

#### 1.4.3.1 Collection of Geologic Samples

The geologist took the following samples, as appropriate:

1) select samples–specimens representing a particular rock type taken for assay;

2) composite samples–rock and soil taken systematically from a dump or tailings pile for assay, representing the overall composition of material in the source;

3) leach samples–duplicates of selected composite samples for testing leachable metals (EPA Method 1312).

The three types of samples were used, respectively, to characterize the economic geology of the deposit, to examine the value and metal content of dumps and tailings, and to verify the availability of metals for leaching when exposed to water. Assay samples were only taken to provide some information on the types of metals present and a rough indication of their concentrations. Outcrops and mine waste were not sampled extensively enough to provide reliable estimates of tonnages, grades, or economic feasibility.

### 1.4.4 Field Methods

An MBMG hydrogeologist visited all of the sites that the geologist determined had the potential for environmental problems. A hydrogeologist also visited the sites that only had evidence of seasonal water discharges, possible sedimentation, airborne dust, mine hazards, or stability problems and determined if there was a potential for significant environmental problems. The hydrogeologist then determined whether sampling was warranted and if so, selected soil and water sampling locations.

### 1.4.4.1 Selection of Sample Sites

This project focused on the impact of mining on surface water, ground water, and soils. The reasoning behind this approach was that a mine disturbance may have high total metal concentrations yet may be releasing few metals into the surface water, ground water, or soil. Conversely, another disturbance could have lower total metal content but be releasing metals in concentrations that adversely impact the environment.

The hydrogeologist selected and marked water and/or soil sampling locations based on field parameters (SC, pH, Eh, etc.) and observations (erosion and staining of soils/streambeds) and chose sample locations that would provide the best information on the relative impact of the site to surface water and soils. If possible, surface-water sample locations were chosen that were upstream, downstream, and at any discharge points associated with the site. Soil sample locations were selected in areas where waste material was obviously impacting natural material. In most cases where applicable, a composite-sample location across a soil/waste mixing area was selected. In addition, all sample sites were located to assess conditions on National Forest System lands; therefore, samples sites were located on National Forest System lands to the extent ownership boundaries were known.

Because monitoring wells were not installed as part of this investigation, the evaluations of impacts to ground water were limited to strategic sampling of surface water and soils. Background water-quality data are restricted to upstream surface-water samples; background soil samples were not collected. Laboratory tests were used to determine the propensity of waste material to release metals and may lend additional insight to possible ground-water contamination at a site.

### 1.4.4.2 Collection of Water and Soil Samples

Sampling crews collected soil and water samples, and took field measurements (streamflow) in accordance with the following:

> **Sampling and Analysis Plan (SAP)**–These plans are site specific, and they detail the type, location, and number of samples and field measurements to be taken.
>
> **Quality Assurance Project Plan (QAPP**) (Metesh, 1992)–This plan guides the overall collection, transportation, storage, and analysis of samples, and the collection of field measurements.
>
> **MBMG Standard Field Operating Procedures (SOP)**–The SOP specifies how field samples and measurements will be taken.

1.4.4.3 Marking and Labeling Sample Sites

Sample-location stakes were placed as close as possible to the actual sample location and labeled with a sample identification number. The visiting hydrogeologist wrote a sampling and analysis plan (SAP) for each mine site or development area that was then approved by the USFS project manager. Each sample location was plotted on the site map or topographic map and described in the SAP; each sample site was given a unique seven-character identifier based on its location, sample type, interval, and relative concentration of dissolved constituents. The characters were defined as follows:

| | |
|---|---|
| D | DA T L I C |
| D: | Drainage area-determined from topographic map |
| DA: | Development area (dominant mine) |
| T: | Sample type: T-Tailings, W-Waste Rock, D-Soil, A-Alluvium, L-Slag, S-Surface Water, G-Ground Water |
| L: | Sample location (1–9) |
| I: | Sample interval (default is 0) |
| C: | Sample concentration (High, Medium, Low) determined by the hydrogeologist, based on field parameters. |

1.4.4.4 Existing Data

Data collected in previous investigations were neither qualified nor validated under this project. The quality-assurance managers and project hydrogeologists determined the usability of such data.

## 1.4.5 Analytical Methods

The MBMG Analytical Division performed the laboratory analyses and conformed, as applicable, to the following:

Contract Laboratory Statement of Work, Inorganic Analyses, Multi-media, Multi-concentration. March 1990, SOW 3/90, Document Number ILM02.0, U.S. EPA, Environmental Monitoring and Support Laboratory, Las Vegas, NV

Method 200.8 Determination of Trace Metals in Water and Waste by Inductively Coupled Plasma and Mass Spectrometry-U.S. EPA

Method 200.7 Determination of Trace Metals in Water and Waste by Inductively Coupled Plasma and Mass Spectrometry-U.S. EPA

If a contract laboratory procedure did not exist for a given analysis, the following method was used:

> Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846, 3rd edition, U.S. EPA, Washington D.C.
>
> EPA Method 1312 Acid-rain Simulation Leach Test Procedure-Physical/Chemical Methods, SW-846, 3rd edition, U.S. EPA, Washington D.C., Appendix G.

All analyses performed in the laboratory conformed to the MBMG Laboratory Analytical Protocol (LAP).

### 1.4.6 Standards

EPA and various state agencies have developed human health and environmental standards for various metals. To put the metal concentrations that were measured into some perspective, they were compared to these developed standards. However, it is understood that metal concentrations in mineralized areas may naturally exceed these standards.

#### 1.4.6.1 Water-Quality Standards

The Safe Drinking Water Act (SDWA) directs EPA to develop standards for **potable** water. Some of these standards are mandatory (primary), and some are desired (secondary). The standards established under the SDWA are often referred to as primary and secondary maximum contaminant levels (MCLs). Similarly, the Clean Water Act (CWA) directs EPA to develop water-quality standards (acute and chronic) that will protect **aquatic organisms**. These standards may vary with water hardness and are often referred to as the Aquatic Life Standards. The primary and secondary MCLs along with the acute and chronic Aquatic Life Standards for selected metals are listed in table 2. In some state investigations, the standards are applied to samples collected as total-recoverable metals. Because total-recoverable-metals concentrations are difficult if not impossible to reproduce, this investigation used dissolved metals concentrations.

Table 2. Water-quality standards.

| | PRIMARY MCL[1] (mg/L) | SECONDARY MCL[2] (mg/L) | AQUATIC LIFE ACUTE[3,4] (mg/L) | AQUATIC LIFE CHRONIC[3,5] (mg/L) |
|---|---|---|---|---|
| Aluminum | | 0.05-0.2 | 0.75 | 0.087 |
| Arsenic | 0.05 | | 0.36 | 0.19 |
| Barium | 2 | | | |
| Cadmium | 0.005 | | 0.0039/0.0086[6] | 0.0011/0.0020[6] |
| Chromium | 0.1 | | 1.7/3.1[6,7] | 0.21/0.37[6,7] |
| Copper | | 1 | 0.018/0.034[6] | 0.012/0.021[6] |
| Iron | | 0.3 | 1 | |
| Lead | 0.015[10] | | 0.082/0.2[6] | 0.0032/0.0077[6] |
| Manganese | | 0.05 | | |
| Mercury | 0.002 | | 0.0024 | 0.000012 |
| Nickel | 0.1 | | 1.4/2.5[6] | 0.16/0.28[6] |
| Silver | | 0.1 | 0.0041[8] | 0.00012[8] |
| Zinc | | 5 | 0.12/0.21[6] | 0.11/0.19[6] |
| Chloride | | 250 | | |
| Fluoride | 4 | 2 | | |
| Nitrate | 10(as N) | | | |
| Sulfate | 500[9] | 250 | | |
| pH (Std. Units) | | 6.5-8.5 | | |

(1) 40 CFR 141; revised through 8/3/93
(2) 40 CFR 143; revised through 7/1/91
(3) Priority Pollutants, EPA Region VIII, August 1990
(4) Maximum concentration not to be exceeded more than once every 3 years.
(5) 4-day average not to be exceeded more than once every 3 years.
(6) Hardness dependent. Values are calculated at 100 mg/L and 200 mg/L.
(7) $Cr^{+3}$ species.
(8) Hardness dependent. Values are calculated at 100 mg/L.
(9) Proposed, secondary will be superseded.
(10) Action level, EPA Drinking Water Regulations & Health Advisories, October 1996 EPA822-B-96-002

1.4.6.2 Soil Standards

There are no federal standards for metal concentrations and other constituents in soils; acceptable limits for such are often based on human and/or environmental risk assessments for an area. Because no assessments of this kind have been done, metal concentrations in soils were compared to the limits postulated by the EPA and the Montana Department of Health and Environmental Sciences for sites within the Clark Fork River basin in Montana. The proposed upper limit for lead in soils is 1,000 mg/kg to 2,000 mg/kg, and 80 to 100 mg/kg for arsenic in **residential** areas. The Clark Fork Superfund Background Levels (Harrington-MDHES, oral commun., 1993) are listed in table 3.

Table 3. Clark Fork Superfund background levels (mg/kg) for soils.

| Reference | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| U.S. Mean soil | 6.7 | 0.73 | 24.0 | 20.0 | 58 |
| Helena Valley Mean soil | 16.5 | 0.24 | 16.3 | 11.5 | 46.9 |
| Missoula Lake Bed Sediments | - | 0.2 | 25.0 | 34.0 | 105 |
| Blackfoot River | 4.0 | <0.1 | 13.0 | - | - |
| Phytotoxic Concentration | 100 | 100 | 100 | 1,000 (500*) | 500 |

*A more recent level of 500 mg/kg for lead was provided for state superfund programs (Judy Reese, oral commun., 1999). The 1,000 level is an upper limit for lead and not used at CFR sites. For reference, Reese also provided the following Clark Fork Superfund **phytotoxicity** levels:

Table 4. Various levels of toxicity for lead (ARWWS : Anaconda Regional Water and Waste Standards, a part of the Anaconda National Priorities List).

| Source | | ppm |
|---|---|---|
| ARWWS ecological RA | low pH<6.5 | 94 (Natural Resource Damage #) |
| ARWWS ecological RA | low pH>6.5 | 179 (Natural Resource Damage #) |
| ARWWS ecological RA | high pH<6.5 | 250 |
| ARWWS ecological RA | high pH>6.5 | 250 |
| Kabata-Pendias & Pendias (1992) | | 100-400 |
| CH2MHill (1987) | | 1,000 |

1.4.7 Analytical Results

The results of the sample analyses were used to estimate the nature and extent of potential impact to the environment and human health. Selected results for each site are presented in the discussion; a complete listing of water-quality, soil chemistry are presented in appendix IV.

The data for this project were collated with existing data and incorporated into a new MBMG abandoned-inactive mines data base. The data base will eventually include mines and prospects throughout Montana. It is designed to be the most complete compilation available for information on the location, geology, production history, mine workings, references, hydrogeology, and environmental impact of each of Montana's mining properties. The data fields in the current data base are presented in appendix V and are compatible with the MBMG geographic information system (GIS) package.

## 1.5 Kootenai National Forest

Approximately 1.8 million acres are administered by the USFS in the Kootenai National Forest (KNF). The area lies west of the Continental Divide in northwest Montana (figure 2). The USFS regional office is located in Missoula, Montana, with the Supervisor's office in Libby and district offices located in Trout Creek (Cabinet), Libby (Libby and the former Fisher River), Troy (Three Rivers), Fortine (Murphy Lake), and Eureka (Rexford). The northern half of the Wallace 1E x 2E quadrangle and most of the Kalispell 1E x 2Equadrangle cover the area. KNF-administered land lies within portions of Sanders and Lincoln counties.

The topography is typical of southwestern Montana's basin and range province, grading from semiarid grass/sagebrush-vegetated valleys to coniferous forests and alpine peaks above timberline. Cedar, western white pine, Englemann spruce, western hemlock, lodgepole pine, Douglas fir, and western larch dominate the forest (GORP, 1998). Higher elevations (above 6,000 ft) grow whitebark pine, mountain hemlock, and alpine larch. The Cabinet Mountains and the 94,272 acre Cabinet Mountains Wilderness lie within the central portion of the KNF. Typical elevations in the KNF range from 8,000 ft in the Cabinets and 7,000+ ft in the Ten Lakes Scenic Area. Snowshoe Peak is 8,738 ft and A Peak is 8,634 ft, both in the Cabinet Mountains. Valley elevations are about 2,600 ft in the towns of Libby and Eureka making the mountains' relief even more spectacular; the lowest point in Montana (1,828 ft) is along the Montana-Idaho border where crossed by the Kootenai River.

1.5.1 History of Mining

Some knowledge of the local mining history is helpful in understanding the problems created by the abandoned and inactive mines in the area. The first metal production in the area came from placer mining in 1867 (Johns, 1970) along Howard Creek. Lyden (1987) described the placer

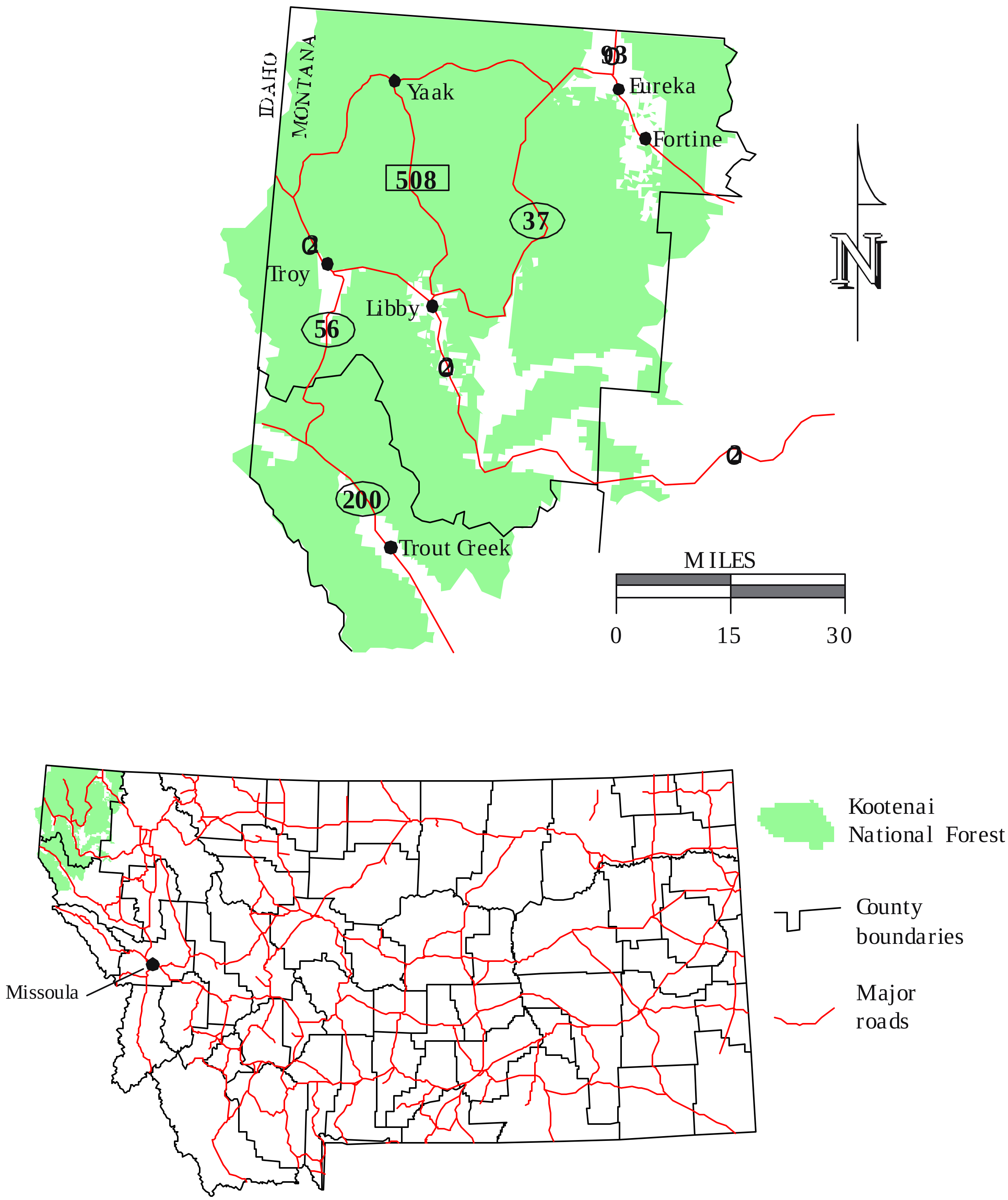


Figure 2. The Kootenai National Forest and associated wilderness areas cover nearly 2.2 million acres in northwest Montana.

mining in the area from 1904 to 1945 when a total of 4,318 fine ounces of gold was recovered from Lincoln County. No very large placer deposits were noted; the largest was Libby Creek and its tributaries. Seventy-five percent of the gold taken from the county was from this area. Other, smaller placer occurrences were located on Fisher River, Big Cherry Creek, Yaak River, Callahan Creek, Kootenai River, Tobacco River, and Wolf Creek. Production from these was measured in a few ounces to tens of ounces. Placers in Sanders County produced a little more than 1,300 ounces from 1904 to 1945. Most came from the Vermilion River, Trout Creek and the Clark Fork River downstream from Trout Creek. Placer mining continues in these areas, albeit small scale, to present day.

The late-1880's saw the advent of lode mining in Lincoln County. The Snowshoe (lead-silver-gold) mine (in the Libby district) was one of the largest producers in the area (Johns, 1970), producing over $1,000,000 since 1892 (Banister and others, 1981). The Snowstorm mine in the Callahan Creek area was another large producer in Lincoln County, and it operated prior to 1905. It eventually produced over $4,000,000 worth of lead, zinc, silver, and gold. Mines in the West Fisher area were located by the 1890's, including the Branagan, Jumbo and American Kootenai mines. Johns (1970) noted that the Midas mine also produced tungsten during the years of World War I. Banister and others (1981) stated that there were over 300 claims located within the Cabinet Mountains wilderness study area between 1882 and 1973. Non-metallic minerals mined from the Sanders and Lincoln counties area include vermiculite, barite, and other minerals mined in even smaller amounts than vermiculite and barite.

In Lincoln County, the Kootenai National Forest includes all or part of four mining districts and four “areas” as defined by Johns (1970). These lode mining districts include Libby, Troy, West Fisher (Cabinet), and Eureka, and the “areas” include the Ural near Eureka, Northern Thompson Falls, Thompson Lakes, and Yaak River. In Sanders County, Crowley (1963) defined the following districts that are associated with the Kootenai National Forest: Blue Creek, Noxon-Cabinet, Pilgrim Creek, Trout Creek, Vermilion River (Silver Butte), and White Pine. Koschmann and Bergendahl (1968) described only two mining districts in Sanders and Lincoln counties—those being Libby and Sylvanite. Sahinen (1935) included seven districts in Lincoln County, including Cabinet/West Fisher, Libby/Snowshoe, Rainy Creek, Sylvanite, Tobacco River, Troy (Grouse Mountain/Callahan), and Wolf Creek. He divided the portion of Sanders County that is encompassed in the Kootenai National Forest into the districts of Blue Creek (Heron), Silver Butte (Vermilion, Cabinet), Trout Creek, and White Pine (Eagle).

Placers, in general, reached their maximum production before 1872, when the richest ones began to play out; production was primarily by “hydraulicking” and by sluicing. By 1870, production from gold and silver lode deposits had become important. Most lode mines had been discovered by the late 1880's, with the main period of production from 1880 to 1907. Mines with silver as the major commodity were most active from 1883 until 1893, when the silver panic forced the closure of many of these polymetallic mines. Many operations never resumed. Mines yielding gold ores, especially of the "free milling" variety, which contain free gold, enjoyed greater longevity. Some of these gold producers were worked until 1942 when the federal government placed restrictions on gold mining as a result of World War II. During World War II, government price supports and essential industry rulings brought many small to medium copper, lead, and zinc properties into production. Following the war, the increased supply and labor costs coupled with the withdrawal of price supports prematurely closed most of these properties. The Korean Conflict brought some of these back on line as once again the government influenced the economics of mining. Additional properties were brought on line as the Defense Logistics Agency went through a period of creating stockpiles of critical strategic minerals.

#### 1.5.1.1 Production

Johns (1970) estimated production from Lincoln County including the years from 1900 to 1964 at approximately $5,000,000 with most of the value coming from lead and gold. Crowley (1963) estimated production from Sanders County for the years of 1906 to 1961 at approximately $13,000,000. The greatest production years were 1917 to 1919, with aggressive production lasting until 1929. A small resurgence of mining in Lincoln County in the early 1940's and in the 1980's added to the total production. Again, according to Johns (1970), placers additionally produced 2,904 ounces of gold and 109 ounces of silver for a total worth of $72,571 in the years from 1906 to 1964. Crowley (1963) estimated placer production from Sanders County yielded 571 ounces of gold and 86 ounces of silver for a total worth of $17,184. Lead production peaked in Sanders County in 1937–1938. No records from the previous years were noted in these references but considerable production probably took place during this time.

Table 5. The estimated relative production from Lincoln and Sanders counties.

| | Tons | Gold (oz) | Silver (oz) | Copper (lb) | Lead (lb) | Zinc (lb) | Total $ |
|---|---|---|---|---|---|---|---|
| Lincoln County | 513,927 | 25,903 | 1,179,918 | 148,622 | 40,745,609 | 13,924,988 | $4,990,768 |
| Sanders County | 7,308,705 | 1,388 | 726,783 | 3,070,548 | 135,491,901 | 2,129,435 | $12,763,545 |

The estimated values reflect the price of commodities at the time of production and not current prices.

#### 1.5.1.2 Milling

An understanding of the history of milling developments is essential for interpreting mill sites, understanding tailings characteristics, and determining the potential for the presence of hazardous substances. Mills, usually adjacent to the mine, produce two materials: 1) a product that is either the commodity or a concentrate that is shipped off site to other facilities for further refinement, and 2) mill waste, which is called tailings.

In the 1800's, almost all mills treated ore by crushing and/or grinding to a fairly coarse size followed by concentration using gravity methods. Polymetallic sulfide-ores were concentrated and shipped to be smelted (usually to sites off USFS-administered land). Gold was often removed from free-milling ores at the mill by mercury amalgamation. Cyanidation arrived in the United States about 1891, and because it resulted in greater recovery rates, it revolutionized gold extraction in many districts. Like amalgamation, cyanidation also worked only on free-milling ores, but it required a finer particle size. About 1910, froth flotation became widely used to concentrate sulfide ores. This process required that the ore be ground and mixed with reagents to liberate the ore-bearing minerals from the barren rock.

Overall then, there were two fundamental processes used for ore concentration: gravity and flotation, and three main processes used for commodity extraction: amalgamation, cyanidation, and smelting. Each combination of methods produced tailings of different size and composition, each used different chemicals in the process, and each was associated with a different geologic environment.

### 1.6 Summary of the Kootenai National Forest Investigation

A total of 299 sites were identified in or near the Kootenai National Forest (KNF) by using the USBM MILS data base as a basic reference. Other sources of information include Calkins and MacDonald (1909), Gibson (1948), Johns (1970), Banister and others (1981), and Crowley (1963). Table 6 summarizes the process by which the final results were achieved in the Kootenai National Forest inventory. These numbers are accurate to the extent that the current data base is updated. The numbers will change reflecting progress in database entry and additional information.

Table 6. Summary of Kootenai National Forest investigation.

| Total number of abandoned/inactive mines sites that were: | |
|---|---|
| <u>PART A - Field Form</u> | |
| Located in the general area from MILS | 299 |
| <u>PART B - Field Form (Screening Criteria)</u> | |
| Screened out by KNF minerals administrator or by description in literature | 181 |
| Location inaccurate | 23 |
| Visited by MBMG geologist | 97 |
| Screened out by geologist | 65 |
| <u>PART C - Field Form</u> | |
| Sampled (water and soil) | 30 |

An individual discussion of each of the 30 sites that were referred to the hydrogeologists and were sampled is included in this report.

### 1.7 Mining Districts and Drainage Basins

The Kootenai National Forest includes more than 12 mining districts as defined by several authors. These boundaries are subject to interpretation and change; often the same district is known by various names. Some mines are not located in traditional districts, so for the purposes of this study, all the mines studied have been organized by drainage basin. This is a convenient way to separate the National Forest into manageable areas for discussion of geology and hydrogeology, and perhaps more important, it is an aid to the assessment of cumulative environmental impacts on the drainage.

#### Clark Fork and Kootenai River Drainages

The lower Clark Fork and upper Kootenai river drainages are in the Kootenai National Forest, west of the Continental Divide (figure 3). Major tributaries of the Clark Fork River within the southern area of the Kootenai National Forest include the Vermilion River, Trout Creek, and the Bull River. The Kootenai River is fed by the Tobacco River, Fisher River, Libby Creek, and the Yaak River.

### 2.1 Geology

Some of the most recent geologic studies in the area resulted in two USGS bulletins that describe the Cabinet Mountains and Scotchman Peak wilderness areas (USGS bulletins 1501 and 1467). The Cabinet Mountains area studied by Wells et al. (1981) is dominated by Belt Supergroup rocks– Precambrian metasediments. Minor mafic sills (in the Wallace Formation) and small stocks intrude the metasedimentary rocks. The sediments have been metamorphosed to a greenschist facies and the original size fractions of the rocks were clay, silt, and sand. The total sedimentary package exceeds 27,000 ft thickness. Earhart (1981) wrote a summary of the Scotchman Peak Wilderness Study area in Montana and Idaho.

Dahlem (1959) mapped the geology at the confluence of the Yaak and Kootenai rivers. His thesis described the Prichard, Ravalli and Wallace formations in the area as well as the Purcell lava and the glacial geology. In this report, Dahlem described the geology associated with the Duplex and Oro-Highland mines.

## 2.2 Economic Geology

The Kootenai National Forest contains all or part of many mining districts: White Pine, Trout Creek, Vermilion (Silver Butte), Rock Creek, Troy (Callahan and Grouse Mountain), and Blue Creek districts, with many small unnamed outliers in the other drainages (Sahinen, 1935). The upper Kootenai drainage, in addition, contains the Sylvanite, Tobacco River, Rainy Creek, Libby (Snowshoe), Cabinet, and Fisher River mining districts defined by the USGS (Sahinen, 1935). Figure 3 represents the mines and mills within the Kootenai National Forest in the lower Clark Fork and upper Kootenai River drainages.

The Cabinet Mountains host the majority of the mineral development in the Kootenai National Forest with outliers in the east flank of the Bitterroot Range and in the Whitefish Mountains. Deposits are found in veins in the Belt rocks or as strata-bound occurrences in Belt rocks. Ravalli, Prichard and Wallace formations are the primary hosts. The single dominant structural feature that is associated with mineral localities is the north-striking Snowshoe fault that has been traced for over 16 miles in the Cabinet Mountains. The northwest-striking Rock Lake fault continues for another 12 miles to the south (Gibson, 1935).

Silver-lead veins have been the most exploited, with gold-quartz veins and copper deposits composing minor production. Placer mines have been small, scattered, and moderately productive compared to placers in Montana as a whole.

## 2.3 Hydrology and Hydrogeology

Average annual precipitation in the Kootenai Forest ranges from 14 to18 inches per year in valleys and from 60 to 80 inches in the mountains. Most precipitation occurs in the spring months in the form of rain or snow. Temperatures in the forest vary from well below 0EF during the winter to greater than 100EF during the summer.

The Kootenai National Forest has an areal extent of about 1.8 million acres. The Clark Fork, Fisher, Yaak, and Kootenai rivers descend westward from greater than 7,000 ft above sea level in the headwaters to 2,175 ft above sea level at Noxon on the Clark Fork River and 1,940 feet above sea level at Troy on the Kootenai River.

The USGS currently maintains seven stream-flow gaging stations within the Kootenai National Forest. The locations, station numbers, periods of record, drainage areas, and annual mean flows are summarized in table 7.

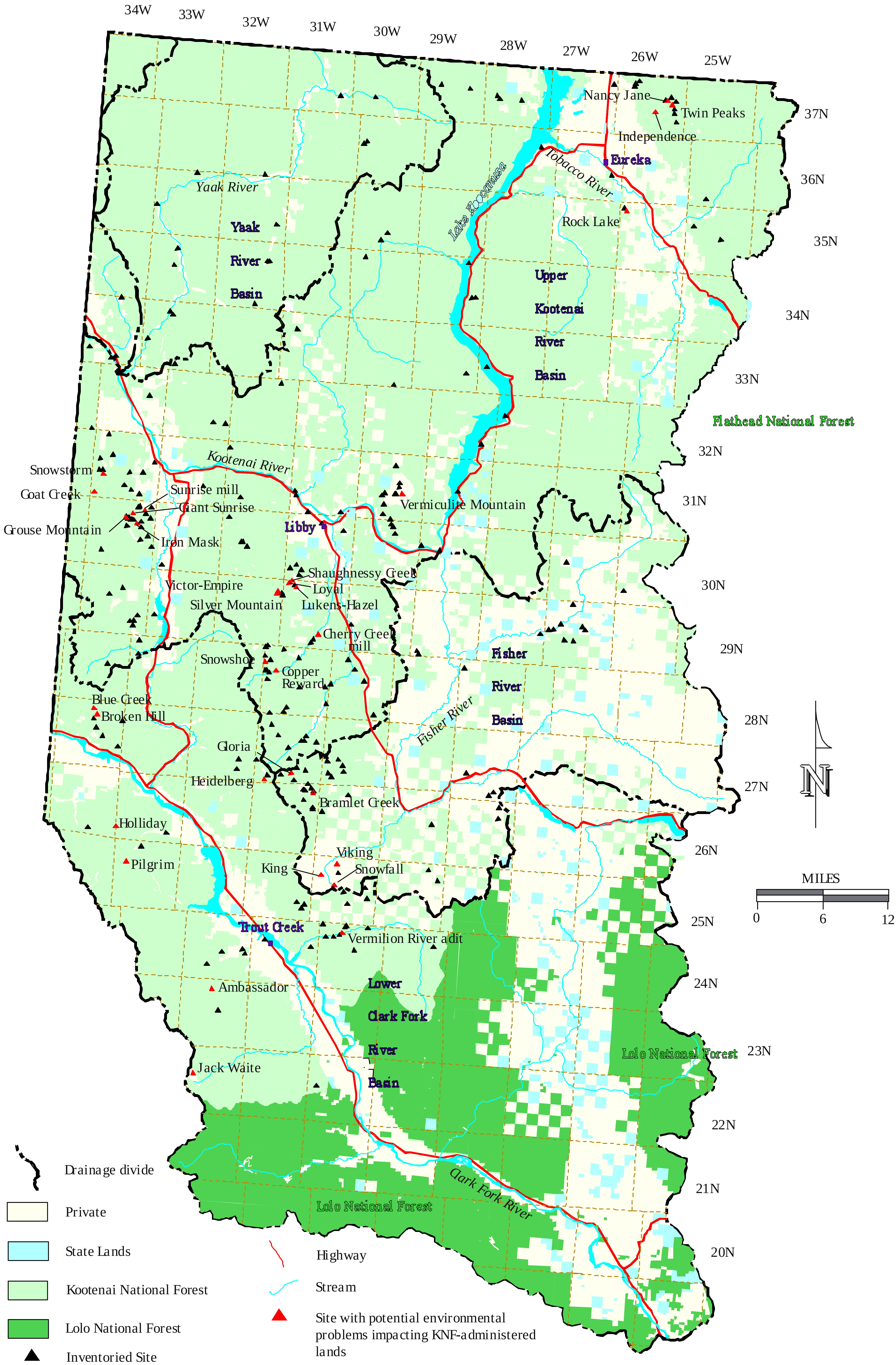


Figure 3. The abandoned-inactive mines in the Kootenai National Forest are located in four drainage basins. The Lolo National Forest lies to the south-southeast and the Flathead National Forest to the east.

Table 7. USGS stream-gage locations within the Kootenai National Forest.

| Gage Location | USGS Station Number | Period of Record (WY) | Drainage Area (Sq. Miles) | Annual Mean Flow (cfs) |
|---|---|---|---|---|
| Clark Fork below Noxon Rapids Dam, near Noxon, MT | 12391400 | 1960-1997 | 21,833 | 20,610 |
| Tobacco River near Eureka, MT | 12301300 | 1959-1997 | 440 | 273 |
| Kootenai River below Libby Dam near Libby, MT | 12301933 | 1972-1997 | 8,985 | 11,230 |
| Fisher River near Libby, MT | 12302055 | 1968-1997 | 838 | 498 |
| Basin Creek near Yaak, MT | 12304040 | 1991-1997 | 27.4 | 34 |
| Yaak River near Troy, MT | 12304500 | 1957-1997 | 766 | 881 |
| Kootenai River at Leonia, ID | 12305000 | 1928-1997 | 11,740 | 13,800 |

## 2.4 Summaries of the Lower Clark Fork and Kootenai River Drainages

There are 299 mine and mill sites on or near the Kootenai National Forest within the Clark Fork River and Kootenai River drainages. Of these, 30 were determined to have a potential to have adverse effects on soil or water quality on KNF-administered land (figure 3). Of the 30 that have a potential of affecting KNF-administered land, 13 sites have one or more discharges from workings or waste material, 10 sites exhibited signs of water or wind erosion, and 7 had both an adit discharge and some component of wind or water erosion.

In the summaries, the sites listed in **bold** exhibited one or more environmental problems and are discussed in the following sections. The mines in these drainages are presented generally upstream to downstream with the Clark Fork drainage mines discussed first (table 8) followed by those of the Kootenai River drainage are discussed again, upstream to downstream (table 9).

If mine openings or other dangerous features (unstable structures, highwalls, steep waste-rock dumps) were observed at a site on KNF-administered land, it is identified (Y) under the hazard heading in each table. In general, only those sites at which samples were collected were evaluated. Of the 299 sites inventoried, 32 sites on or partially on KNF-administered land were identified as having potential safety problems.

Table 8. Summary of sites in the lower Clark Fork drainage (Cabinet Ranger District).

| NAME | VISIT | OWNER [2] | SAMPLE | HAZARD [4] | REMARK |
|---|---|---|---|---|---|
| Ajax Placer / See Also Walnut | Y | N | N | NE | Placer: fairly recent location notice as Carl E #4 / Williams-n-Eichert. |
| Amazon Property | Y | N | N | Y | One open adit with crosscut; dry; also two prospects. |
| **Ambassador** | **Y** | **N** | **Y** | **Y** | **One discharging adit, streamside waste.** |
| Bee and Boo Claim Group | N | N | N | NE | Screened out: no site visit; no references; copper. |
| **Blue Creek / Scotchman / North Star** | **Y** | **M** | **Y** | **Y** | **One adit with discharge; streamside waste; seep from toe of dump.** |
| Bonanza Gold Mine | N | N | N | NE | May be Vermilion River adit; unable to identify for certain. |
| Brende Property | N | N | N | NE | See Copper Ridge; SA005413. |
| **Brown Hill / Broken Hill / Bobby** | **Y** | **M** | **Y** | **NE** | **One discharging adit; but no water flowing in drainage at time of visit.** |
| Clark Fork Placer | N | P | N | NE | Screened out: private; placer; flooded by Clark Fork Reservoir. |
| Four up Group | N | M | N | NE | Screened out: only reference to it was MBMG Bulletin 95; status - unknown. |
| Frederick and Wind Group | N | N | N | NE | Screened out: only one reference in MBMG Bulletin 95; p. 23; inaccurate location. |
| Freeman Prospect | N | N | N | NE | Screened out: prospect only. |
| Gold King Prospect | Y | N | N | NE | Two trenches / prospects in the general area. No impact. |
| Gopher Hole Mine | Y | N | N | NE | Prospect only; approximately 6' x 10' x 8' deep. |
| **Heidelberg Mine / Price Claims** | **Y** | **N** | **Y** | **Y** | **Adit discharge and streamside waste.** |
| **Holliday (Homestead / Silver Mark)** | **Y** | **N** | **Y** | **NE** | **2 discharging adits; lower waste dump in contact with W. Fork Pilgrim Creek.** |
| **Jack Waite Mine** | **Y** | **P** | **Y** | **Y** | **Water discharges from an open adit and sinks into ground before flowing onto KNF-administered land.** |
| Laura Apex Group | N | N | N | NE | Unable to locate; reference is Lawson, 1975, MBMG Bulletin 95, p. 24. |
| Lucky Luke | Y | N | N | Y | One open adit. Visited. |
| Miller | N | N | N | NE | Visited general area; no workings noted; access through private land. |
| **Pilgrim** | **Y** | **N** | **Y** | **NE** | **Discharging adit; seep at toe of dump; stream cuts edge of dump.** |
| Razorback | N | N | N | NE | Screened out: only reference is USBM production files & the accuracy is +/-1 km. |
| Red Fir Claims | Y | N | N | NE | Unpatented mining claims; see also Amazon mine. |
| Rock Creek Project / Copper | N | N | N | NE | Screened out: no site visit; only reference in USGS Bulletin 1501; prospect only. |
| Ryan | N | N | N | NE | Screened out: inaccurate location; no references in MILS. |
| Shoestring 1 & 2 | Y | M | N | Y | Mixed ownership– patented/National Forest. |
| Sid Claim | N | M | N | NE | Screened out: no site visit; only reference–MBMG Bulletin 95. |
| Sims Gulch Placer | N | M | N | NE | Screened out: placer; inaccurate location. |
| St. Paul Pass Prospect | N | N | N | NE | Screened out: Cabinet Mountains Wilderness; short adit & prospect only. |

| | | | | | |
|---|---|---|---|---|---|
| Trout Creek Placer | N | M | N | NE | Screened out: placer. Drove through area. No sign of placer. |
| Vermillion Creek Placer | N | N | N | NE | Screened out: visited general area; see Lyden (1948) MBMG Memoir 26 for description. |
| **Vermilion River Adit** | **Y** | **N** | **Y** | **Y** | **One discharging adit, possible streamside waste.** |
| Walnut-Carl E. Placer | Y | N | N | NE | Placer; visited because we were in area. Wash plant and feed box. |
| Waylett Placer | N | M | N | NE | Screened out: placer; drove general area; small placers all along the Vermilion River. |
| White Star (Baker) | Y | N | N | NE | Possibly found mine; prospects/collapsed adits? |

1) Mines in **bold** may pose environmental problems and are discussed in the text; others are included only in appendix II (all mines) and appendix III (short write-ups for each mine).
2) Administration/Ownership Designation
N: KNF-administered land
P: Private
M: Mixed (KNF-administered land and private)
U: Owner unknown
3) Solid and/or water samples (including leach samples)
4) Y: Physical and/or chemical safety hazards exist at the site.
NE: Physical and chemical safety hazards were not evaluated.
5) Mill site present

## 2.5 Jack Waite Mine

### 2.5.1 Site Location and Access

The Jack Waite mine (T22N 32W 17 DAAC) is located on private land that straddles the Montana/Idaho border. A portal and mill are located in Idaho. A portal on the Montana side (Montana Tunnel) is about 15 miles west of Belknap, Montana, and is accessed via Forest Road 152.

### 2.5.2 Site History-Geologic Features

Mineralization associated with the Jack Waite mine was discovered in the early 1900's. The mine was developed in 1911, but due to poor roads, high zinc content, and lack of milling equipment, it was operated sporadically until 1927 at which time the mine was electrified and a 125-ton mill constructed. Major production at the mine ceased in 1961. Between 1911 and 1961, production records show that 687,425 tons of ore were mined, which included 1,549 oz. gold; 616,615 oz. silver; 1,035,240 lbs copper; 133,953,045 lbs lead; and 20,871,892 lbs zinc.

Prichard Formation slate hosts the mineralization, which is along a N.60°W. shear zone that dips 45°-55°SW. Veins range from 1 in. to 12 ft wide and contain siderite/quartz gangue minerals: pyrite, sphalerite, tetrahedrite, chalcopyrite, galena, pyrrhotite, and cosalite are the ore minerals. The workings consist of about 24,000 ft of drifts and crosscuts, and several thousand feet of raises and winzes.

## 2.5.3 Environmental Condition

The Montana Tunnel is open and flooded. Within a few feet of flowing out of the tunnel, the water completely infiltrates into waste material that was dumped into Dixie Creek, a tributary to Beaver Creek. The volume of waste material has been estimated at 3,800 cubic yards (Pioneer Technical Services, 1994). Dixie Creek flows onto the upper end of the waste dump and completely infiltrates into the dump. At the toe of the waste dump, the water re-emerges.

## 2.5.3. Site Features-Sample Locations

Water-quality samples were collected from Dixie Creek upgradient (DJWS10L) and downgradient (DJWS20L) of the site on KNF-administered land. The flow rates at these locations were 7 and 25 gpm, respectively. Upstream, Dixie Creek pH was 6.51 and specific conductance was 40 µmhos/cm. Downstream, Dixie Creek pH was 7.06 and specific conductance was 139 µmhos/cm. Samples were collected on September 10, 1997. Site features and sample locations are shown in figure 4; photographs are shown in figures 4a and 4b.

### 2.5.3.2 Soil

Soil samples were not collected.

### 2.5.3.3 Water

The concentration of analytes in the upstream sample (DJWS10L) did not exceed any water quality standards (table 2). The concentration of lead in the downstream sample exceeded the primary MCL and the chronic aquatic life standard but had no other problems.

Table 9. Jack Waite mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spring upgradient of site (DJWS10L) | | | | | | | | | | | | | | | | | | | |
| Water in gully below S1 shaft (DJWS20L) | | | | | | | | PAC | | | | | | | | | | | |

Exceedence codes:

P - Primary MCL
A - Aquatic Life Acute
C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

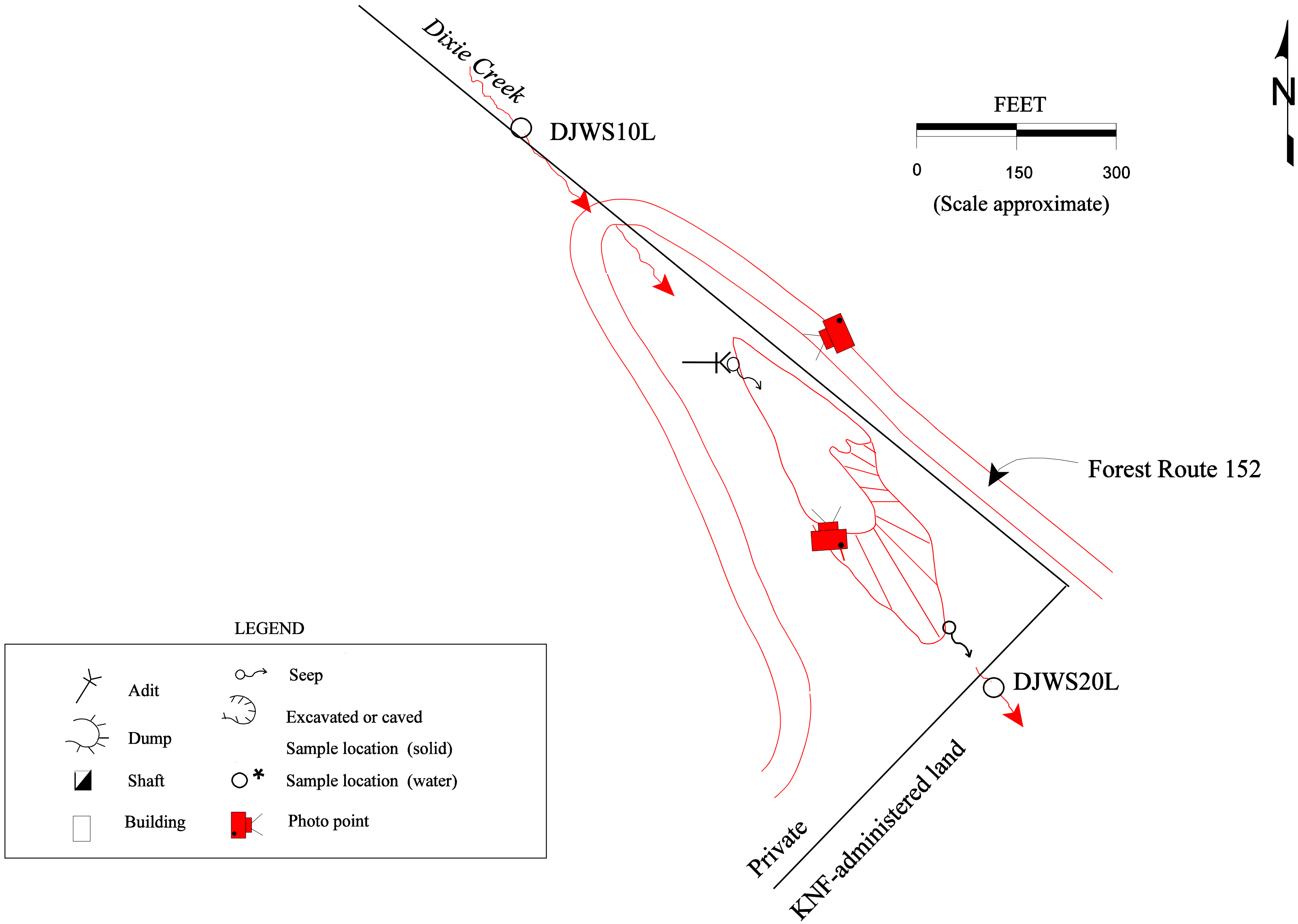


Figure 4. The Jack Waite mine lies predominantly on private land but was sampled on public land.

Figure 4a. The Montana Tunnel at the Jack Waite is open and had a small discharge of water that completely infiltrated into the waste dump.

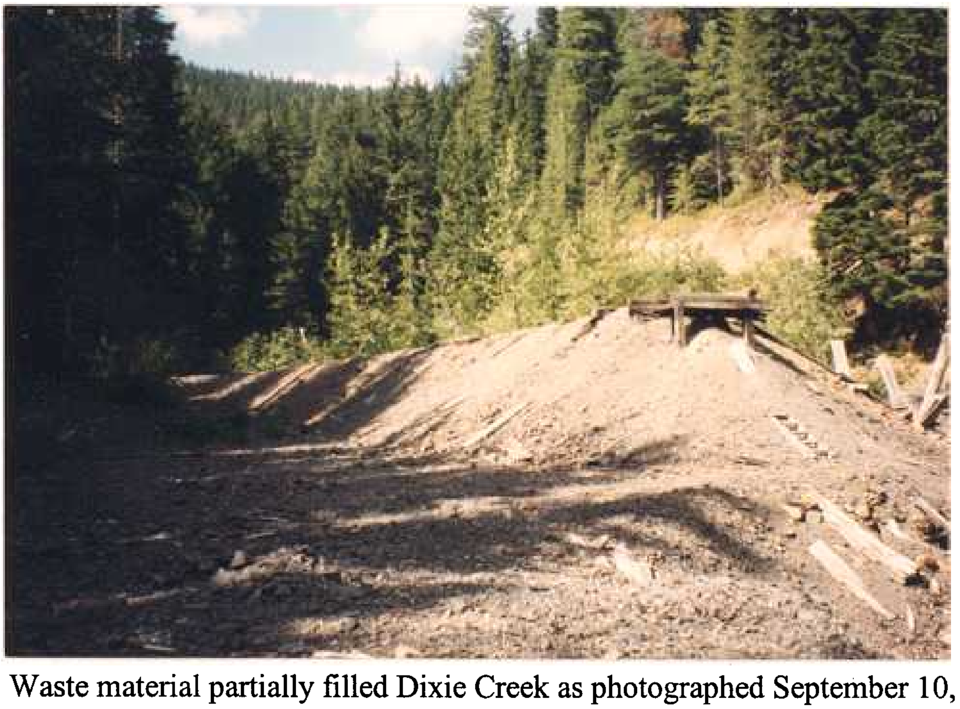

Figure 4b. Waste material partially filled Dixie Creek as photographed September 10, 1997.

2.5.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site.

2.5.3.5 Summary of Environmental Conditions

Water-quality standards upstream of the site are not exceeded. Downstream, the lead MCL and chronic aquatic life criteria are exceeded in the water seeping from the toe of the waste dump. Vegetation on KNF-administered land does not appear to be impacted by the site.

2.5.4 Structures

All structures are on private property and were not evaluated or inventoried.

2.5.5 Safety

The site was on private property and not evaluated for safety.

## 2.6 Vermilion River Adit

2.6.1 Site Location and Access

The unnamed Vermilion River adit was driven to the northwest on the north side of the Vermilion River road. An improved gravel road (Forest Road 154) paralleling the Vermilion River passes within 25 feet of the portal, which is highly visible. The site is approximately 12 miles from the town of Trout Creek and is on the east side of the Clark Fork River. The adit is in BBAA section 09, T24N, R30W on the Seven Point Mountain 7.5-min. quadrangle at an elevation of 2,695 ft.

2.6.2 Site History-Geologic Features

No records were found concerning this site. It was tentatively named the Bonanza by USFS personnel in Trout Creek. The only mention of Bonanza Gold Mining was found in MBMG mineral property files. A newspaper clipping noted that Vermilion Gold, Inc. was renamed Bonanza Gold, Inc. in 1962; the company was owned by Frank H. and Frank D. Duvall. This company were involved in placer mining in the area. Therefore, the name “Bonanza” is very tentatively assigned to this location. This site should also not be confused with the Silver Butte mine that was also known as the “Vermilion,” which is located up Lyons Gulch near Silver Butte Pass.

The adit was driven in argillite (Ravalli or Prichard Formation?) where quartz veins hosted the mineralization. Most mines in the area explored the quartz veins that carried free gold (Crowley, 1963). The tunnel follows a N40°W, 44-50°W 3-ft-wide fault zone with brecciated quartz; the quartz vein is from 6 in. to 12 in. wide. The bedding planes are from 2 in. to 6 in. apart and trend N30°E, 27°N.

### 2.6.3 Environmental Condition

The site consisted of an open adit with a small five gpm discharge. The discharge ran down the road and then crossed it but did not enter the Vermilion River at the surface. The waste from the mine appeared to have been pushed to the south of the road, flattened out, and was in the flood plain of the river. It was not in contact with the river at the time of this study.

#### 2.6.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream on the Vermilion River (VVRS20L) and downstream (VVRS30L) of the site on KNF-administered land. The flow rates at these locations were estimated at 1800 cfs. Upstream, the Vermilion River pH was 7.8 and specific conductance was 76 µmhos/cm. Downstream, the Vermilion River pH was 7.73 and specific conductance was 78 µmhos/cm. Samples were collected on August 21, 1997. The five-gpm discharge from the adit had a pH of 8.08 and SC measured 145, slightly higher than in the river. The adit discharge was sampled approximately 20 feet in front of the adit where a small hole was dug for the water to pool. Site features and sample locations are shown in figure 5; photographs are shown in figures 5a and 5b.

#### 2.6.3.2 Soil

VVRD10H was a composited soil/waste sample taken south of the road where the waste had been pushed. It was taken at the toe of what was discerned as the disturbed area. No sulfides were noted in the sample. Although the metals present were higher than the Clark Fork Superfund background level, they are much lower than the phytotoxic levels.

Table 10. Soil sampling results at the Vermilion River adit (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (VVRD10H) | 14.2[1] | 4.37[1] | 26.2[1] | 43.5[1] | 69.2[1] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3)

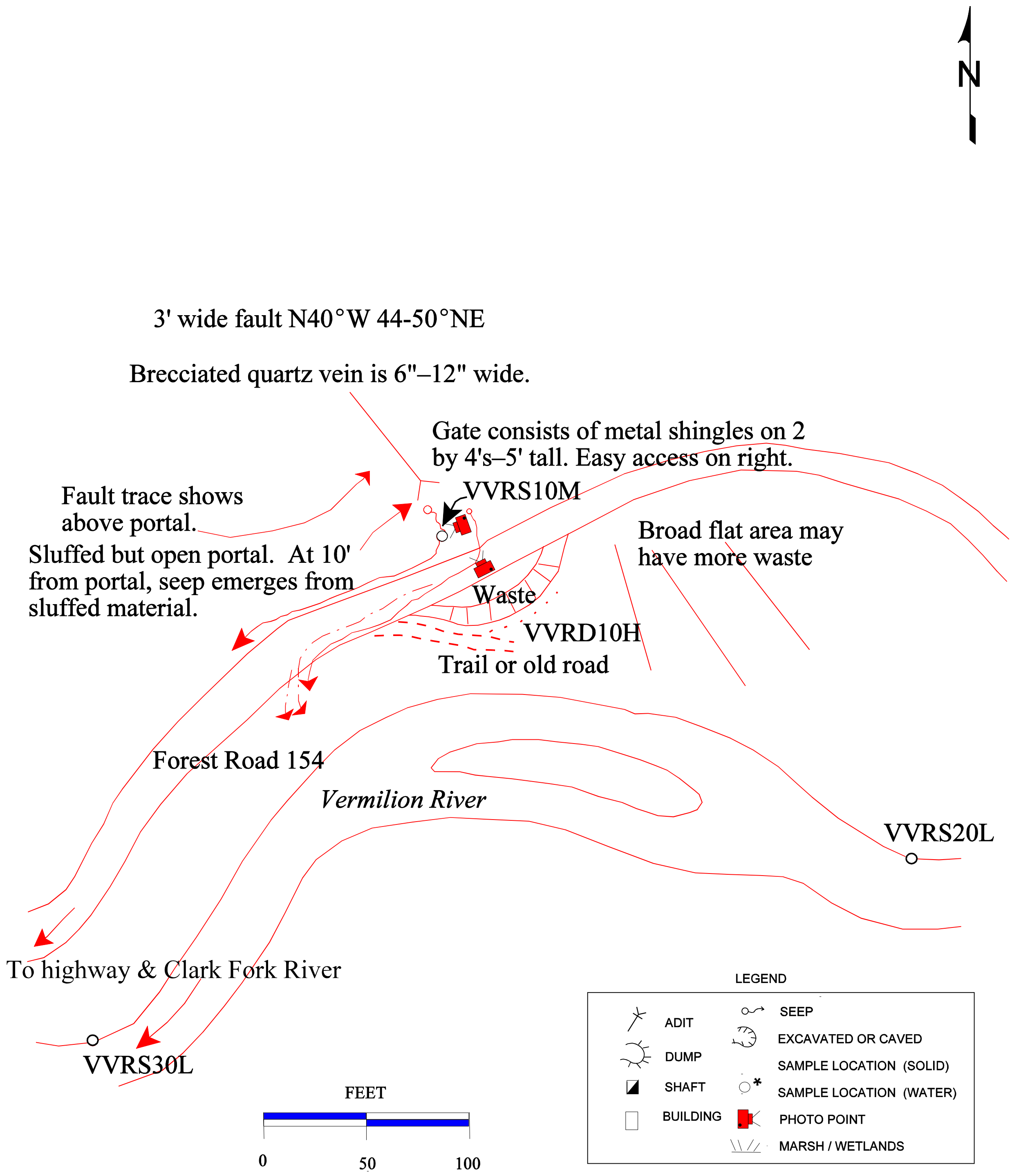


Figure 5. The Vermilion River adit discharged a total of five gpm that intermittently flowed down the road, as mapped 08/27/97.


Figure 5a.The open and easily accessible Vermilion River adit was driven less than 25 feet north of the improved gravel road paralleling the Vermilion River.


Figure 5b. Sample VVRS10M at the Vermilion River adit was taken from a small pool of water formed by the five-gpm adit discharge. It was taken on the north side of the road.

2.6.3.3 Water

The concentrations of analytes in the the upstream sample (VVRS10M) and downstream sample (VVRS30L) did not exceed any water quality standards (table 2). The analyses revealed a slight increase in arsenic and nickel levels, but only to 2.5 and 2.8 µg/L, respectively. The river samples measured below the detection limits on these metals.

Table      Vermilion River adit water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VVRS20L - upstream of site | | | | | | | | | | | | | | | | | | | |
| VVRS30L - down-stream of site | | | | | | | | | | | | | | | | | | | |
| VVRS10M - adit discharge | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

2.6.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. No dead or dying vegetation was noted. The cottonwoods and willows growing in the area appeared healthy. Grasses grew along the discharge channel.

2.6.3.5 Summary of Environmental Conditions

Few or no environmental effects were noted from this adit. The small discharge, at the time of this study, infiltrated into the ground before it reached the Vermilion River. The difference in the amount of flow between the five-gpm adit discharge and the flow in the Vermilion River at the time of sampling precluded the probability of a significant impact.

## 2.6.4 Structures

There were no structures associated with this site. There were the remains of a cabin up the road, but all structures at the site were no longer present.

### 2.6.5 Safety

The open adit had a door made of 2"x 4"s and metal shingles and was approximately five feet tall. It was easily scalable or access could be gained from the sides. It provided only minimal discouragement to the public. No signs were posted. The adit was highly visible from the Vermilion River Road (Forest Road 154).

## 2.7 Ambassador Mine

### 2.7.1 Site Location and Access

The Ambassador mine lies approximately four miles by Forest Service Trail 214 from the gated trailhead that is six miles from the town of Trout Creek. The road along Trout Creek is Forest Road 214. The old road has been washed out in several places as it paralleled Granite Creek. Access is by foot only; alders and Devil's Club grow along the old road. Several large diameter culverts have also been washed out. The mine is located in DDDB section 04, T23N, R32W, at an elevation of 3,740 ft on the Larchwood 7.5-min. quadrangle. The mine lies entirely on KNF-administered land in Sanders County.

### 2.7.2 Site History-Geologic Features

Placer gold was found at the turn of the century in Trout Creek and on Granite Creek (Lyden, 1948), downstream of the Ambassador mine. The lode property was worked since at least 1929; in 1931, a 350-foot adit had been driven and 600 tons of ore stockpiled (Crowley, 1963). Additional work was completed during the years of 1936–1940, 1940's–1956. The portal was caved when visited by Crowley in the early 1960's. The mine map showed the workings to be 1,840 feet in quartzitic argillites and intersecting a mineralized aplite dike (Crowley, 1963). The workings also explored an offshoot of the Granite Creek stock–a syenite with disseminated pyrite. Crowley (1963) published production figures from the Ambassador from 1939 to 1941, including a total tonnage of 93 tons of ore producing 38 ounces of gold, 319 ounces of silver, 613 pounds of copper and 3,680 pounds of lead.

Trauerman and Waldron (1940) listed the Ambassador as consisting of 20 unpatented mining claims. They stated there were plans for a 24-ton mill, but it is unknown if a mill was ever built. No structural remains of a mill were noted in the field visit.

### 2.7.3 Environmental Condition

The adit at the Ambassador discharged a small amount of water, and the waste dump was in the flood plain of Granite Creek. The waste dump had steep sides and was not vegetated on the steep portions. No visible evidence of metals leaching was noted and all effects appeared local.

### 2.7.3. Site Features-Sample Locations

Water-quality samples were collected from Granite Creek upstream (GAMS10L) and downstream (GAMS20L) of the site on KNF-administered land. The flow rates at these locations were approximately 670 gpm, respectively. Adit discharge sample GAMS30H was collected approximately 25 feet in front of the adit in a small pool that formed on the waste dump. A composite sample (GAMD10H) from the toe of the waste dump was taken to evaluate what was being eroded into the creek during high water. Samples were collected on August 27, 1997. Site features and sample locations are shown in figure 6; photographs are shown in figures 6a and 6b.

#### 2.7.3.2 Soil

Soil samples were not collected, but a composite soil/waste sample was taken representing 25 ft along the toe of the waste dump. The waste dump was in contact with Granite Creek. The results showed lead and zinc exceeded the phytotoxic level. The other metal's levels were similar to other mines in the area.

Table 12. Soil sampling results at the Ambassador mine (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (GAMD10H) | 13.4[1] | 4.63[1] | 87.2[1] | 506[1,2] | 605[1,2] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).
(2) Exceeds phytotoxic levels (table 3).

#### 2.7.3.3 Water

The concentration of analytes in the upstream and the downstream samples did not exceed any water quality standards (table 2). Upstream, Granite Creek pH was 6.88 and specific conductance was 22 µmhos/cm. Downstream, Granite Creek pH was 6.95 and specific conductance was 31 µmhos/cm. The water was at fairly low flow but it was evident that the flow of Granite Creek was much higher in the past year. The adit discharge had a higher zinc level (100.8 µg/L) than the creek (~10 µg/L) but it was still below all water quality standards. The flow of the adit was estimated at 5 gpm. There were no exceedences in any of the water quality samples in the adit discharge.

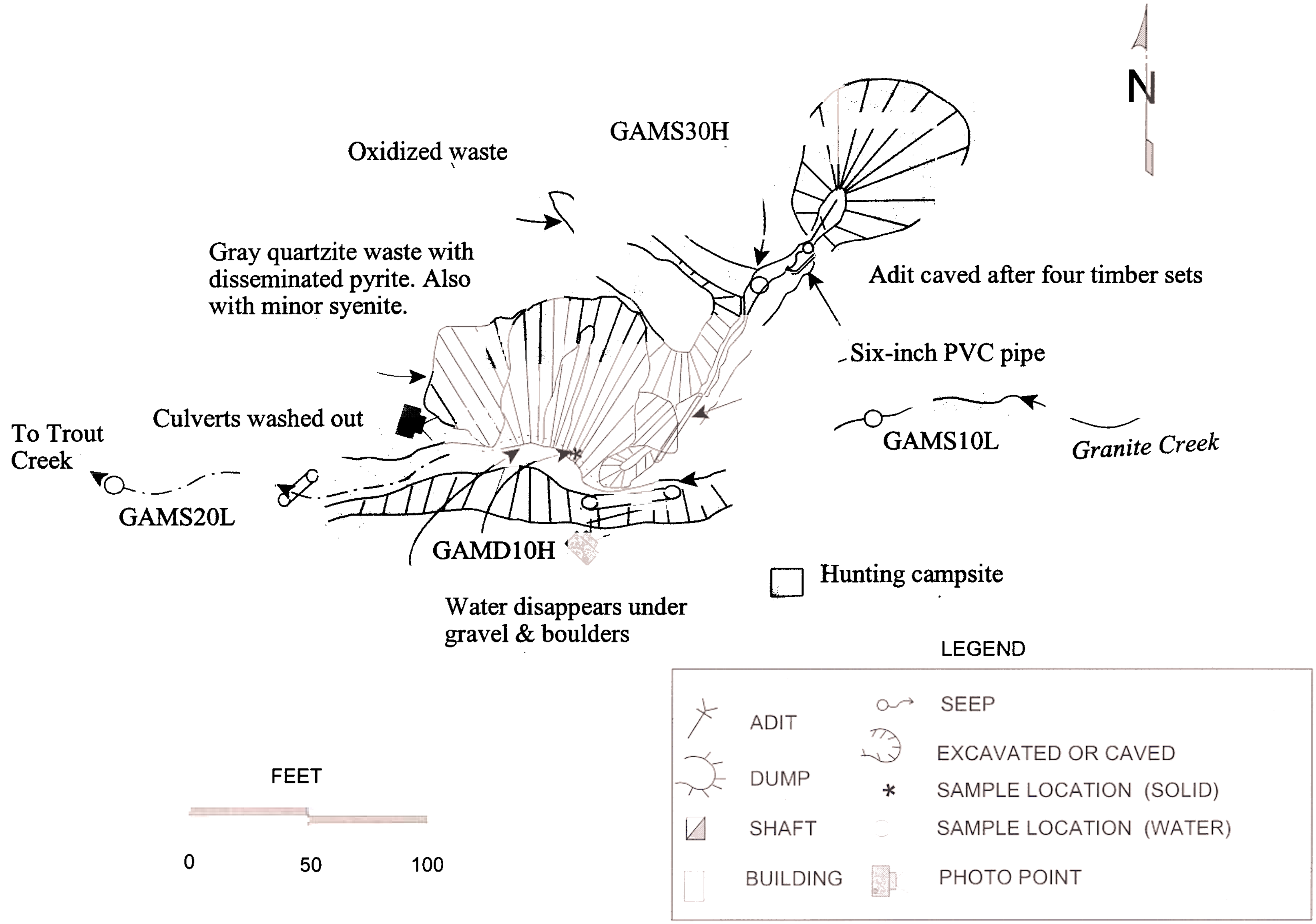


Figure 6. Granite Creek cut the toe of the waste dump at the Ambassador mine, as mapped 08/27/97.

Figure 6a. Granite Creek flowed at a low rate when visited in late August but had obviously flowed at a greater rate previously.

Figure 6b. Granite Creek (at low flow) has cut the waste dump at the Ambassador, resulting in an easily erodible face. The partly open adit lies in upper center of the photo.

Table 13. Ambassador mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GAMS10L-upstream of site | | | | | | | | | | | | | | | | | | | |
| GAMS20L-downstream of mine | | | | | | | | | | | | | | | | | | | |
| GAMS0H-adit discharge | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

2.7.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Grasses grew along the discharge channel and the trees were not affected by mining. Knapweed grew on the disturbed area in front of the adit. The steep face of the waste dump was sparsely vegetated probably because of erosion and the unstable nature of the slope.

2.7.3.5 Summary of Environmental Conditions

The Ambassador mine has only a local effect on the environment; primarily, a physical disturbance. At the time of the sampling, no exceedences of water-quality standards were noted. The soil and waste sample did exceed the phytotoxic levels for lead and zinc.

2.7.4 Structures

All structures were on the south side of Granite Creek and were collapsed. They consisted of two flattened cabins. There was an abandoned hunting camp with signs of fairly recent use. A small amount of trash was strewn through the forest with all but the glass rusting away.

2.7.5 Safety

The adit was open approximately 20 feet back (four timber sets were intact). Granite Creek had cut the creek bank, resulting in a unstable slope. Culverts were perched in the almost dry drainage; they had been washed out, probably by the spring floods. The site is not easily accessible and would only be visited by foot traffic, probably hunters.

## 2.8 Heidelberg Mine or Price Claims

### 2.8.1 Site Location and Access

The Heidelberg mine lies eight miles from Noxon along the Rock Creek road. The last two miles have to be hiked because of the gated road (Forest Road 150A) and the washed-out bridges over Rock Creek. Forest Road 150 up to the gate from Highway 200 is in good condition. The Heidelberg is located ½-mile south of Rock Lake in section 32, T27N, R31W with the lower adit on the Elephant Peak 7.5-min. quadrangle at 4,100 ft elevation and the upper adits on the Howard Lake 7.5-min. quadrangle at an elevation of 5,100 ft.

### 2.8.2 Site History-Geologic Features

In the 1920's, the site originally consisted of 21 unpatented mining claims staked by R.J. Price Mining Company (MBMG mineral property files, 1969); the property has been described as consisting of as many as 21 claims and as few as 12 claims. The Price Company became the Heidelberg Mining Company in 1936 and began work on the lower crosscut tunnel whose objective was mineralization east of Rock Lake. Gibson (1948) listed this occurrence as the "Price" with the workings consisting of an open cut at 5,200 ft and a N20°E adit that had been driven 343 feet as of 1932. These workings probably correspond to the upper Heidelberg area.

The local country rock is the Ravalli Formation (Crowley, 1963), mainly quartzites. The major structural feature–the Rock Lake fault–is a 6-ft-wide shear zone that cuts the Ravalli and trends N33°W, is near vertical, and has a displacement of 2,500 ft (Crowley, 1963). Some mineralization is found associated with the fault. Minerals include sphalerite, galena, pyrite, and chalcopyrite in a quartz vein. The total production from the mine was estimated at 28 tons.

### 2.8.3 Environmental Condition

The adit discharge, while substantial, exhibited no signs of precipitating metals. The discharge infiltrated into the dump and a waste dump seep may be the same water. The waste dump obviously had been eroded by high water flow of Rock Creek. A small amount of mining equipment waste was noted.

### 2.8.3. Site Features-Sample Locations

Water-quality samples were collected from upgradient (RHES20L) and downgradient (RHES30L) of the site on KNF-administered land. The flow rates at these locations were 1.8 cfs. Upstream, Rock Creek pH was 7.28 and specific conductance was 6 µmhos/cm. Downstream, Rock Creek pH was 7.27 and specific conductance was 10 µmhos/cm. The adit discharge was sampled immediately south of the portal; its pH was 7.86 and SC was 32 μmhos/cm. A waste rock and soil sample composite was taken at the base of the waste dump where it was in contact with Rock Creek. Samples were collected on September 09, 1997, when Rock Creek was at a relatively low flow. Site features and sample locations are shown in figure 7; photographs are shown in figures 7a and 7b.

### 2.8.3.2 Soil

One soil sample was collected from the toe of the waste dump where it was in contact with Rock Creek. The metals levels are all well below the phytotoxic limits. They are similar to those found at the Vermilion River adit.

Table 14. Soil sampling results at the Heidelberg mine (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (RHED10H) | 3.28[1] | 0.42[1] | 25.6[1] | 16.9[1] | 44.3[1] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).

### 2.8.3.3 Water

The concentration of analytes in the all of the samples did not exceed any water-quality standards (table 2). Most were at or just above the detection limits. Even the waste dump seep sample did not appreciably increase in metals. Zinc concentrations edged up slightly in the adit and seep samples but were well below the water quality standards.

Table 15. Heidelberg mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RHES20 -upstream of adit | | | | | | | | | | | | | | | | | | | |
| RHES10L-adit discharge | | | | | | | | | | | | | | | | | | | |
| RHES40L-seep from toe of waste dump | | | | | | | | | | | | | | | | | | | |
| RHES30 downstream on Rock Creek | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

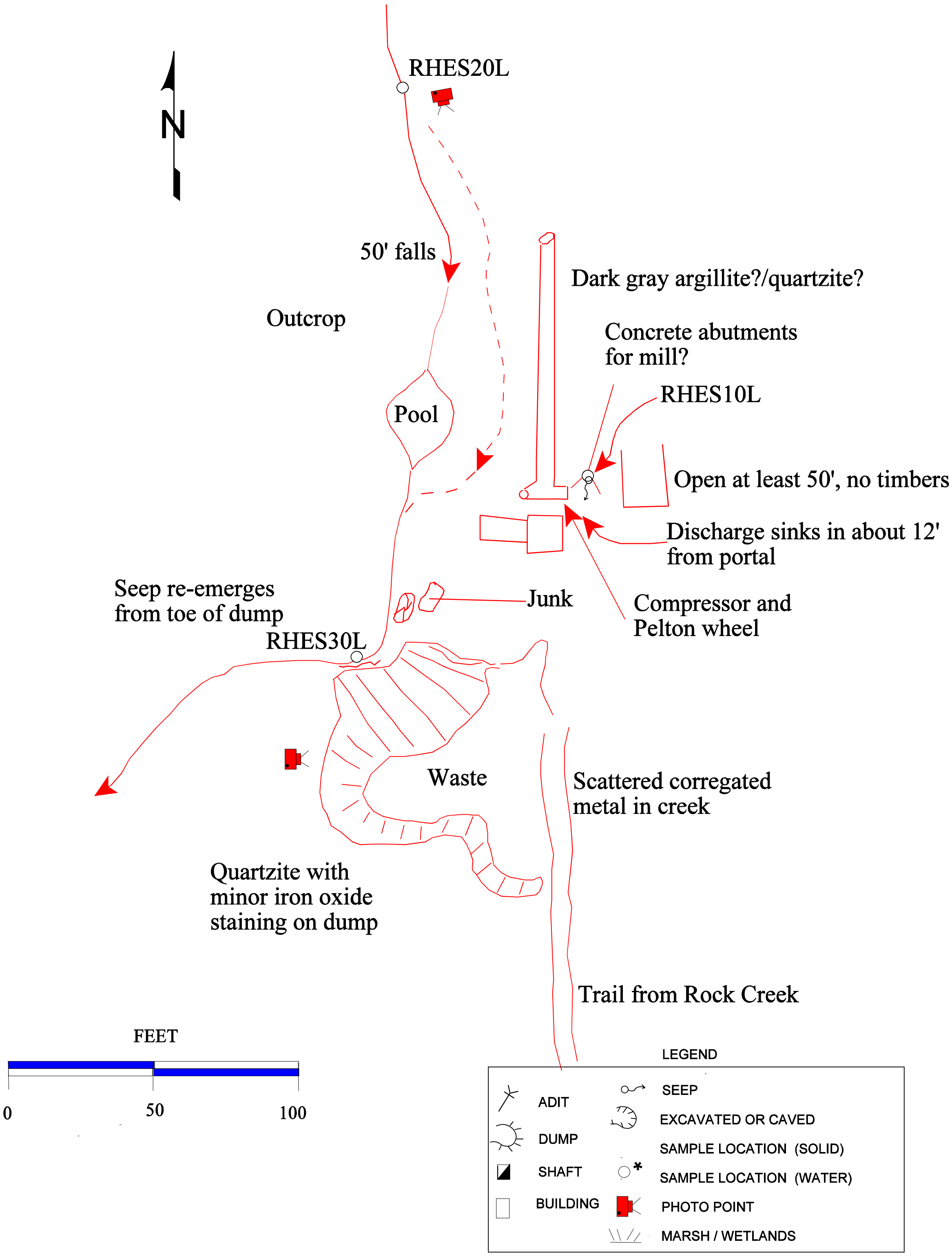


Figure 7. The Heidelberg mine discharged water to Rock Creek and also had a seep from the toe of the dump, as mapped September 9, 1997.

Figure 7a. As viewed from above, the Heidelberg mine consisted of a discharging adit, remnant mining equipment, and a waste dump that was in contact with Rock Creek.

Figure 7b. The discharge from the Heidelberg infiltrated into the waste dump and discharged at the toe. The discharge emerges just below the camera case used for scale.

2.8.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Trees and shrubs grew moderately well on the waste dump except, where the slope was overly steep and eroded by Rock Creek.

2.8.3.5 Summary of Environmental Conditions

The Heidelberg mine area reflects the nature of the mineralization of the deposit. Quartzites and quartz veins host the majority of the mineralization. The lower adit reportedly never intersected the target and so never opened a sulfide orebody to be susceptible to acid-mine drainage. The upper workings are dry.

2.8.4 Structures

The buildings to the northeast of Rock Lake Meadows are in good condition but will probably quickly deteriorate in the future. Pack rats and hikers have started the degradation of the cabins. The large penstock and Pelton wheel at the mine is an attractive structure to hikers and may pose a threat to safety.

2.8.5 Safety

The lower adit is open for at least 50 feet and has no timbering. It appeared in good condition but was slippery with water and inherently dangerous. The upper adits were all caved and were even more remote and inaccessible. The large iron penstock, as stated above, posed an attractive target for climbing. The area is well used by hikers going to Rock Lake and is easily visible. During this study, several groups used the site as a rest stop and point of interest.

## 2.9 Pilgrim Mine

2.9.1 Site Location and Access

The Pilgrim (or Holbert) mine may be found with difficulty six miles southwest of Noxon on the Gem Peak 7.5-min. quadrangle. Access is by an improved gravel road (Forest Road 149) from Noxon that follows Pilgrim Creek, then Forest Road 2713, and then by foot from the Trailhead 1084 on the South Fork Pilgrim Creek. The trail is not the actual mining road but comes close to the mine. The mine was found by following the switchback traces of the barely discernable mining road which branches off from the trail. The mine is located in CCDD section 08, T25N, R33W at an elevation of approximately 3,600 ft on a drainage identified by Johns (1970) as "Tobin Creek."

## 2.9.2 Site History-Geologic Features

Johns (1970) is the primary reference for this mine, and the following is a summary of his findings. Earliest mining took place in the early 1900's when Princemont Mining Company of Idaho claimed the Pilgrim Group of six mining claims. The claims were later (1926) worked by the Cabinet Range Copper Mining Company. The next mention of the mine was in 1960 when one adit was accessible but filled with water. The workings consisted of three tunnels: 200, 700, and 2,000 ft long.

The geology of the mine area was described as "thin-bedded, light greenish-grey, slightly calcareous argillite with some thick beds of brownish-grey quartzite." The formation's strike was northeast and its dip was 60°NW. It was described as Newland or Wallace *slates*. Calcite was abundant, with minor malachite, azurite, and chalcopyrite in quartz.

## 2.9.3 Environmental Condition

Vegetation cloaked the caved adit and the dump was surrounded by large coniferous trees. No evidence of adverse effects was noted. The grasses that had revegetated the waste dump grew rampantly. As was the case with most of the mines in this area, the effects here were restricted to the disturbed area.

### 2.9.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream (PPIS20L) and downstream (PPIS30L) of the site on KNF-administered land. The flow rates at these locations were estimated as 1 cfs. Upstream, Tobin Creek pH was 7.31 and specific conductance was 64 μmhos/cm. Downstream, Tobin Creek pH was 7.28 and specific conductance was 51 μmhos/cm. The adit discharge was also sampled (PPIS10L), and its pH was 6.9 and SC was 69 μmhos/cm. Samples were collected on August 28, 1997. Site features and sample locations are shown in figure 8; photographs are shown in figure 8a and 8b.

### 2.9.3.2 Soil

Soil samples were not collected. The waste dump was exclusively large angular fragments and not prone to erosion.

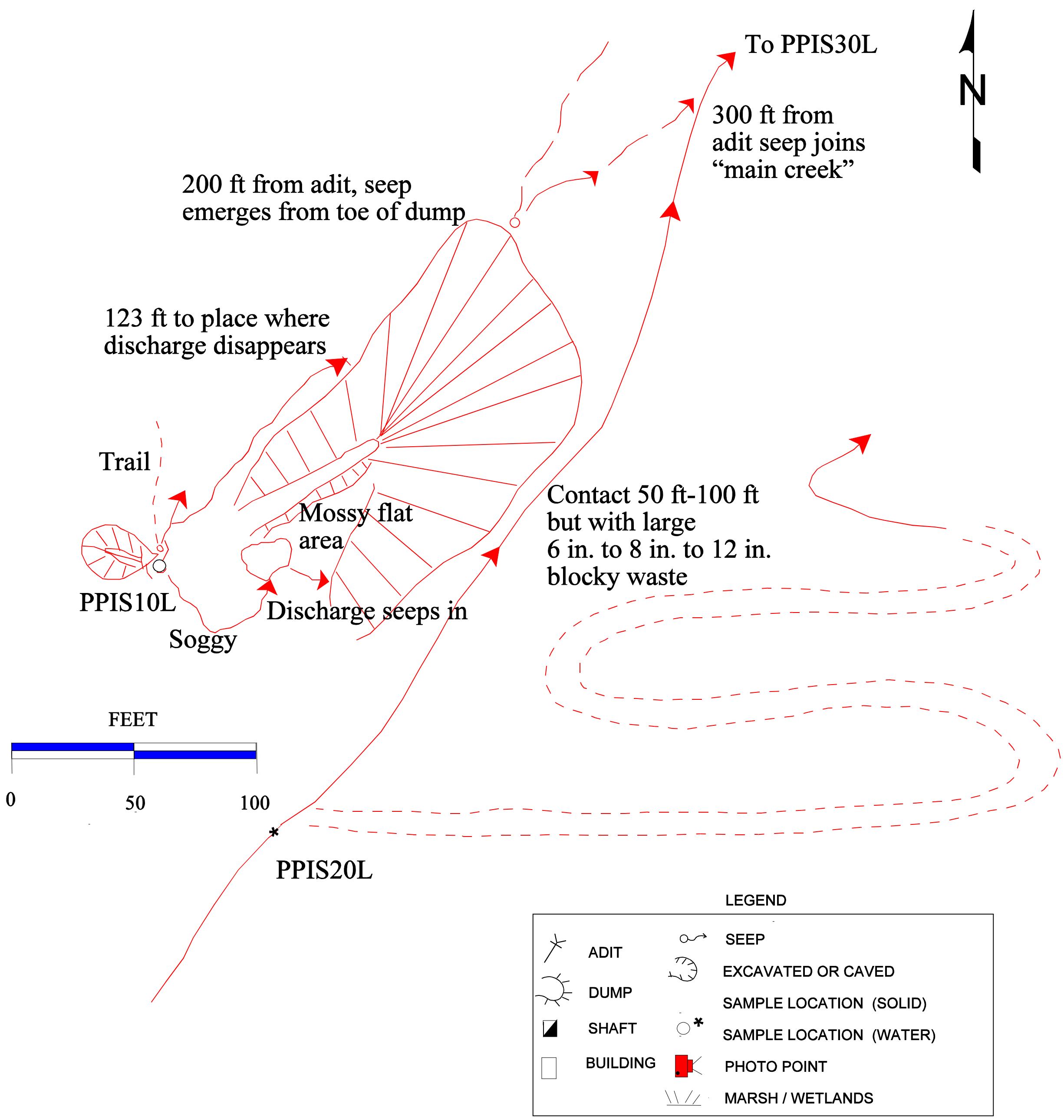


Figure 8. The adit discharge at the Pilgrim pooled on the waste dump and then emerged at the toe, as mapped 08/28/97.

Figure 8a. At the Pilgrim mine, the 20-gpm discharge was practically hidden by the verdant undergrowth. The discharge channel had a slight iron staining.

Figure 8b. A pool of water formed by the discharge at the Pilgrim mine also had healthy vegetation surrounding it.

2.9.3.3 Water

The concentration of analytes in all of the samples did not exceed any water quality standards (table 2). There was a slight increase in the concentration of arsenic (5.7 µg/L) in the adit discharge compared to the two creek water samples but it did not exceed any water quality standards. The upstream and the downstream samples both had slightly higher (4.4 and 5.1 µg/L, respectively) zinc concentrations than the adit discharge (<2 µg/L).

Table 16. Pilgrim mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PPIS20L-upstream of site | | | | | | | | | | | | | | | | | | | |
| PPIS10L-adit discharge | | | | | | | | | | | | | | | | | | | |
| PPIS30L-downstream of Pilgrim | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

2.9.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Both the understory vegetation and the trees were healthy. Mosses grew in and around the adit discharge channel. Wildflowers and grasses grew up to the edge of the small pool of water on the waste dump. The sides of the waste dump were not well vegetated, probably because of the lack of soil.

2.9.3.5 Summary of Environmental Condition

The discharging adit had no effect on the downstream water quality as sampled by MBMG. The slightly elevated arsenic level in the adit discharge was not detectable downstream. The small concentrations of zinc in the upstream and downstream samples appeared to be a background level for the area.

2.9.4 Structures

No structures or evidence of any structures remained at the site.

### 2.9.5 Safety

The site was remote and no evidence of any visitors was observed. The site is close to a designated Forest Service trail but not on it. The waste dump had steep flanks with loose rocks and may be considered a safety hazard.

## 2.10 Holliday (Homestead) Mine

### 2.10.1 Site Location and Access

The Holliday (or Homestead) mine lies seven miles west of Noxon, following improved gravel Forest Road 149 for five miles and then two miles on Route 2744 to a locked gate. The lower adit lies approximately ½-mile beyond the gate, to the south of a small clearing. The upper adit can be found by following the closed road another ½-mile to the northwest and then to the south. The adits all lie in AADD section 36, T26N, R34W at an elevation of 3,400 and 3,600 ft, respectively.

### 2.10.2 Site History-Geologic Features

The mine was named for Mark V. Holliday, of Noxon, who operated the mine in the 1960's under the name Silver Mark Mines, Inc. (MBMG mineral property files). Unpatented mining claims associated with the site include the Harold, Bob, Homestead, Ross, Extension, Cabin, and Christie. Later, the Kenny claim was worked in 1968 and as late as 1971.

Crowley (1963) was the primary reference for this mine and his description is summarized here. The Pilgrim Creek unorganized mining district contains the Holliday, as well as the Pilgrim, Miller, and White Star mines. The Holliday was first worked in 1939 by the Homestead Mining Company, then described as developing from 1945 to 1949, and inactive from 1950 to 1956. Holliday Mines, Inc. took over in 1957 and shipped 16 tons of ore in 1961 that yielded 20 ounces of silver, 2,000 pounds of lead, and 600 pounds of zinc.

Two adits were driven to explore the mineralization here: an upper one (presently caved) and the main lower one (also caved). Crowley (1963) mentioned that a winze sunk in the lower adit was flooded in 1961. A mine map can be found in Crowley (1963).

Milky white quartz veins with irregular occurrences of sulfides fill fractures in the Wallace Formation calcareous argillite. Little wall-rock alteration was noted. Ore minerals were pyrite, sphalerite, chalcopyrite, galena, and marcasite. A N45°W-trending vertical fault was mapped 280 feet into the adit, but it did not appear to control the mineralization.

2.10.3 Environmental Condition

Two adits at the Holliday had small discharges, and both waste dumps showed evidence of having been in contact with the creek in the past. The lower dump had a steeply eroded face. The workings and the discharges were typical of this area. The effects of the mine were restricted to the immediate area; no widespread effects were noted. The maximum area of surface disturbance was approximately 300 ft by 700 ft. Past studies included Pioneer Technical Services' sampling in 1993 that found the chronic aquatic life standard for lead was exceeded in the lower adit discharge, and in the upstream and downstream samples.

2.10.3. Site Features-Sample Locations

Water-quality samples were collected from West Fork Pilgrim Creek upstream of all mining disturbance (PHOS10L) and downgradient (PHOS40L) of the lower adit on KNF-administered land. The flow rates at these locations were 60 gpm and 673 gpm, respectively. Upstream, West Fork Pilgrim Creek pH was 6.33 and specific conductance was 35 µmhos/cm. Downstream, West Fork Pilgrim Creek pH was 7.59 and specific conductance was 34 µmhos/cm. Samples were collected on August 13, 1997. The discharges from the upper adit (PHOS20H) and lower adit (PHOS50L) flowed less than 10 gpm and neither one directly entered the active drainage. Site features and sample locations are shown in figure 9; photographs are shown in figures 9a and 9b.

2.10.3.2 Soil

One soil sample was collected at the toe of the waste dump. The sample probably contained some waste because the dump was being undercut by the creek.

Table 17. Soil sampling results at the Holliday mine (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (PHOD10H) | 9.48[1] | 4.33[1] | 8.7[1] | 12.2[1] | 104[1] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3)

2.10.3.3 Water

The concentration of analytes in the upstream and downstream samples (PHOS10L and PHOS50L) did not exceed any water quality standards (table 2). Both analyses of the adit discharge samples showed 10 times greater zinc levels than those of the stream samples. Strontium also was appreciably higher in the adit discharge samples. All other metals were at or

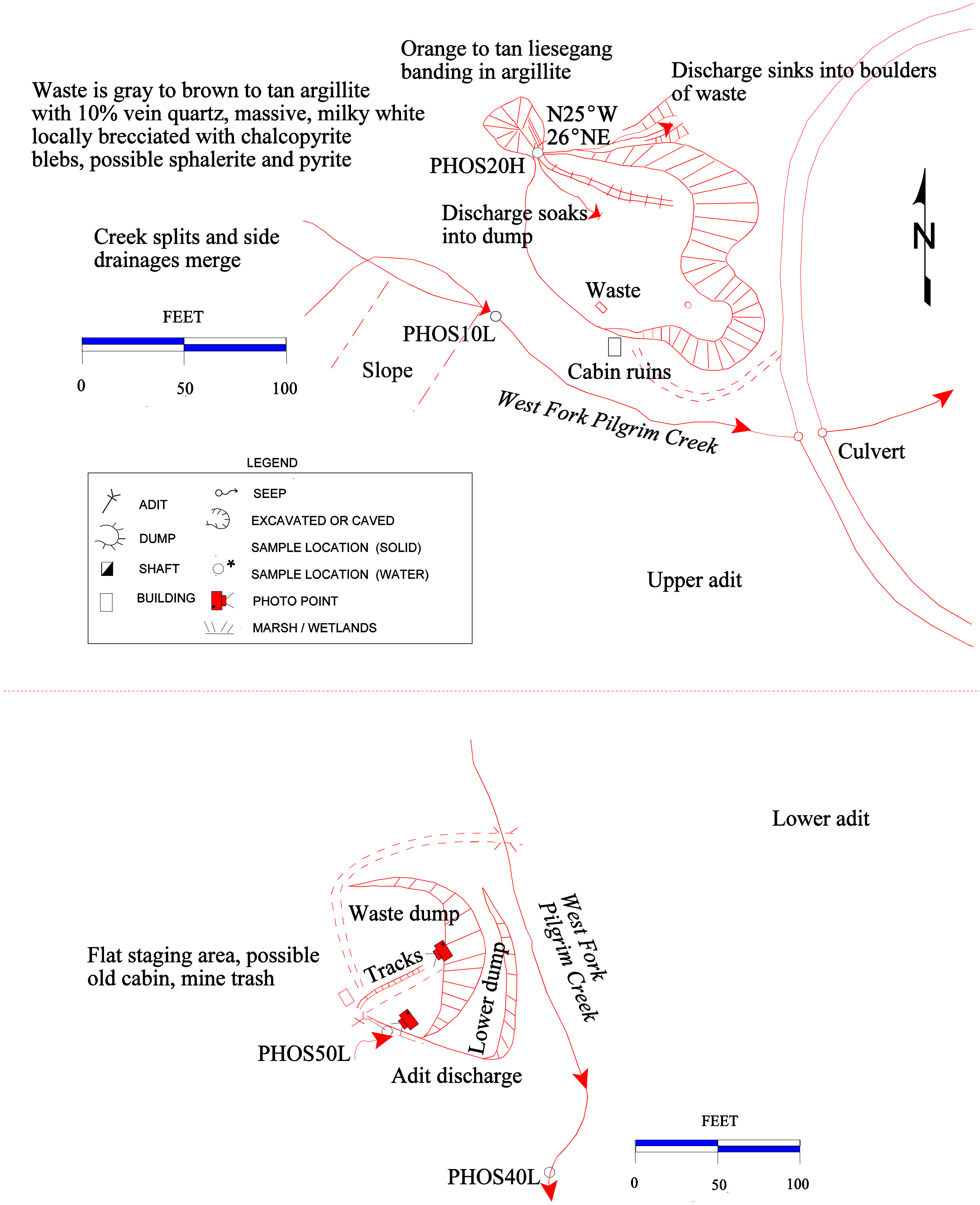


Figure 9. The upper and lower adits at the Holliday had small discharges, as mapped 8/28/97.

Figure 9a. At the Holliday mine, none of the structures shown in the old mine maps of the lower workings remained. Only mine car tracks and a small amount of rusting debris marked the mine site.

Figure 9b. The 8-gpm discharge from the lower adit at the Holliday had little evidence of metals precipitating in the channel. Hoses, pipes, and scrap metal marked the collapsed adit.

below detection limits in all four samples. The laboratory pH measurements of 7.47 and 7.57 for the lower adit and the upstream sample, respectively, were within water-quality standard limits. The field pH measurements for these two samples were 5.94 and 6.33. The upper adit discharge pH measurements also had a 0.8 discrepancy. It was not determined which measurement was correct.

Table 18. Holliday (Homestead) mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PHOS10L-upgradient of all mining | | | | | | | | | | | | | | | | | | | S[1] |
| PHOS20H-upper adit discharge | | | | | | | | | | | | | | | | | | | |
| PHOS50L-lower adit discharge | | | | | | | | | | | | | | | | | | | S[1] |
| PHOS40L-downstream of mining activity | | | | | | | | | | | | | | | | | | | |

Exceedence codes:
(1) Laboratory pH did not exceed standard.
Note: The analytical results are listed in appendix IV.

### 2.10.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be severely impacted by the site. Knapweed grew on the disturbed areas. The support area in front of the lower adit was sparsely vegetated, probably because of the crushed waste rock that armored it.

### 2.10.3.5 Summary of Environmental Conditions

Only local effects of the mining activity were noted at the Holliday. The area of surface disturbance was less than one acre at each adit.

## 2.10.4 Structures

Structures, including an ore bin, an aluminum compressor house, sheds, and an aluminum house, shown on the mine map by Crowley and Newman (MBMG mineral property files, 1961), were no longer present at the Holliday.

2.10.5 Safety

Rusting debris posed the greatest safety threat here. The waste dumps also were steep but not overly so. The adits were completely caved, and the lower ones were difficult to locate.

## 2.11 Brown Hill or Broken Hill Mine

2.11.1 Site Location and Access

The Broken Hill mine is a little over ½-mile southeast of the Blue Creek mine in section 10, T27N R34W at an elevation of 4,240 ft. Access is the same as the Blue Creek mine (Forest Road 490), but instead of following 490 to the Blue Creek, bear right on Forest Road 2290 to the gate where the remaining two switchbacked miles of road must be hiked. The patented claims had been recently logged, so the road was in good condition.

The mine is labeled as the "Brown Hill" on the Heron 7.5-min. quadrangle, but all of the literature on the mine's history lists it as "Broken Hill." Two patented claims associated with the site are the Broken Hill and the Bobby; both adits lie on patented land.

2.11.2 Site History-Geologic Features

According to MBMG files, the Broken Hill was mined from 1923 to 1927. Only two adits were driven to the east on the property with a winze connecting them. Minerals associated with the mine include (in order of abundance) galena, sphalerite, pyrite, pyrrhotite, and chalcopyrite (Gibson, 1948). The site was mined in the 1920's by the Broken Hill Silver-Lead Mining Co., and then the Federal Mining and Smelting Co. then by H.C. Conn (Crowley, 1963). Other owners included Continental Mining Company, W.J. Nichols, and Swann, Swann and Goddard. Both adits were reported as caved in 1960 (Crowley, 1963). They originally explored a total length of at least 458 ft.

Similar mineralogy to the Blue Creek mine was found in the Broken Hill and it may be associated with the same "Blue Creek" fault. Ore minerals include pyrite, pyrrhotite, sphalerite, galena, chalcopyrite, and arsenopyrite in quartz-tourmaline-tremolite veins (Crowley, 1963).

2.11.3 Environmental Condition

No water flowed in the intermittent tributary to the East Fork of Blue Creek at the time of this study. The adit discharge pooled on the waste dump and then infiltrated into the dump. It did not re-emerge at the base. No negative environmental effects were noted besides the physical disturbance of the mine.

2.11.3.1 Site Features-Sample Locations

Water quality could only be measured in the pooled water on the waste dump (BBHS10H). Samples were collected on September 11, 1997. Site features and sample locations are shown in figure 10; photographs are shown in figures 10a and 10b.

2.11.3.2 Soil

Soil samples were not collected. The waste dump had no sign that the waste was ever in contact with the active drainage. All effects were confined to the local area. Pioneer Technical Services estimates the waste rock dump to be 6,200 cubic yards.

2.11.3.3 Water

The concentrations of analytes in the adit discharge exceeded the water-quality standard for zinc only (table 2). The zinc concentration in the downstream sample exceeded the chronic and acute aquatic life standards, but the site had no other problems. The discharge was estimated at 20 gpm by MBMG and at 25 gpm by Pioneer Technical Services (1995). Pioneer's sampling of the adit discharge found chronic aquatic life criteria exceedences in lead, mercury, and zinc.

Table 19. Broken Hill mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBHS10H-adit discharge | | | | | | | | | | | | | AC | | | | | | |

Exceedence codes:
- A - Aquatic Life Acute
- C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

2.11.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. The waste-rock dump was only sparsely vegetated with 6 ft–20 ft spruce and fir trees. The trees that were present were healthy, as were the trees that grew surrounding the area.

2.11.3.5 Summary of Environmental Conditions

All effects at the Broken Hill were local and confined to the disturbed area. Both adits were on patented ground. The lower waste dump was on KNF-administered land.

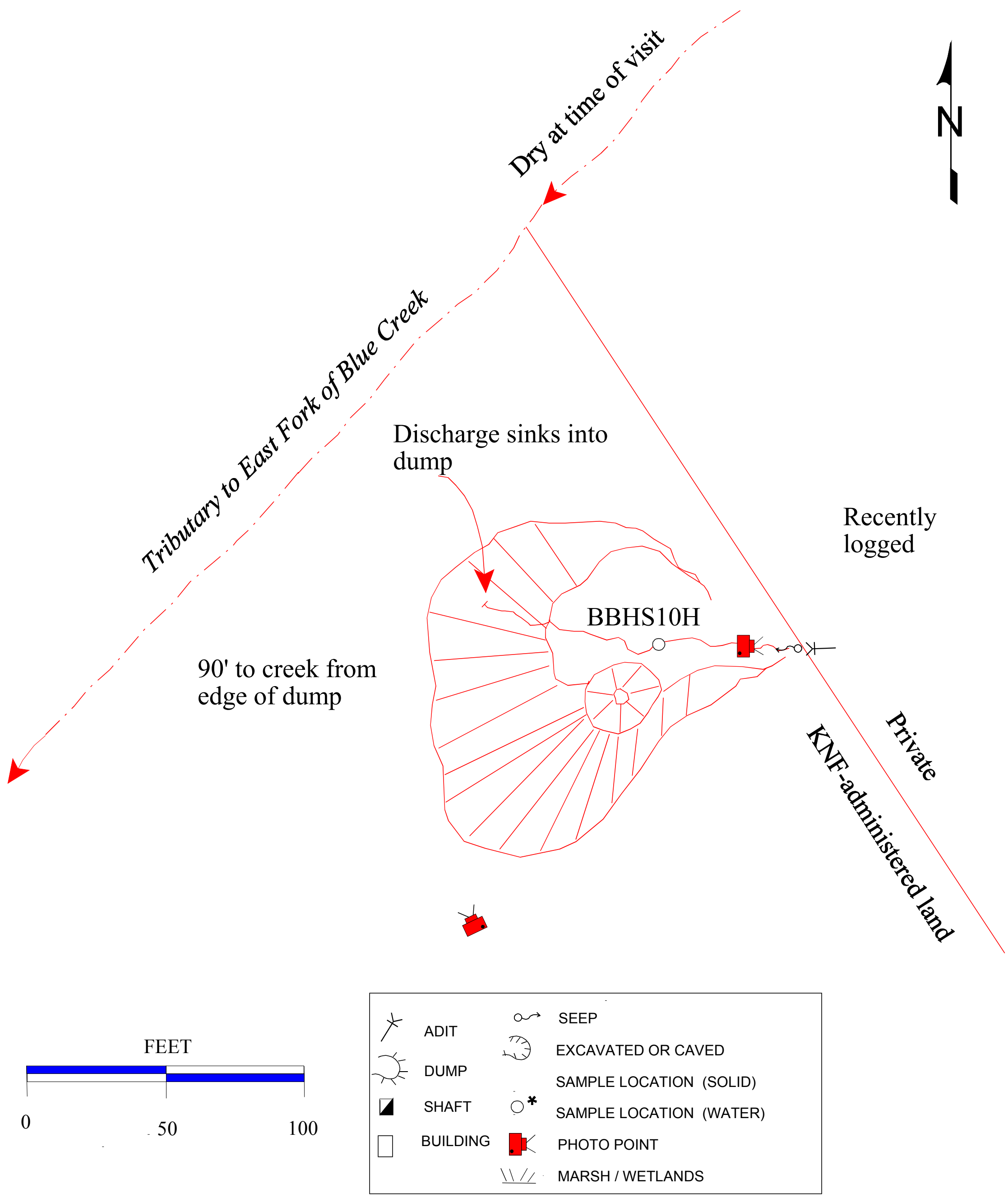


Figure 10. The Broken Hill mine was predominantly patented, but the discharge flowed onto KNF-administered land.

Figure 10a. Water flowed from the caved adit on patented land at the Broken Hill but immediately pooled on the waste dump on KNF-administered land.

Figure 10b. The Broken Hill waste dump was steep and largely unvegetated with the slope reflecting the steep topography surrounding the site.

### 2.11.4 Structures

One ore loadout or ore bin remained at the base of the waste dump. No other structures remained at the Broken Hill. A few scattered pieces of lumber lay on the waste dump.

### 2.11.5 Safety

The adits at the site were private and not evaluated for safety. The waste dump was very steep and poorly vegetated. The site was remote and access was restricted by the locked gate at the bottom of the hill. Hunters were observed in the general area, but no other signs of use were noted.

## 2.12 Blue Creek or Scotchman Mine

### 2.12.1 Site Location and Access

The Blue Creek, or Scotchman, mine was found in CC section 03, T27 N R34W on the Sawtooth Mountain 7.5-min. quadrangle about five miles from Highway 200. Access is via the Blue Creek Road (Forest Road 409) then one mile later the road splits to the East Fork of Blue Creek (still road 409), in another 1.7 miles, bear left on 409 (don't take 2290). The end of the road is 1.2 miles farther where access is by foot through a timber clearcut another 1,000 feet to the mine site. The elevation of the site is approximately 3,200 feet. The south adit is entirely on private, patented land and the north adit is on private land, but the waste dump is on KNF-administered land.

### 2.12.2 Site History-Geologic Features

The Blue Creek silver-lead-zinc mine has been known by many names including Stackhouse, North Star, and Scotchman. The deposit may have been worked as early as 1908–1910 by Montana Mining and Milling Company (Crowley, 1963). According to MBMG mineral property files, the workings totaled 2,500 feet of tunnel, a 40-foot shaft and stopes. Blue Creek Mining was the operator of the Stackhouse claims (named after Pearl Stackhouse). Other references list the claim names Scotchman #6, #6½, #7, Blue Creek #1, #2, and Hillside claims. Lucky Star Mining Company worked the mine from 1966 to 1970.

The following summary is from an MBMG report in 1967 and from Crowley (1963). The deposit was described as a replacement deposit in a 14-foot-thick shear zone in altered argillite. Galena, sphalerite, pyrite, arsenopyrite, chalcopyrite, sericite, and chlorite were associated with several inch to two-ft quartz veins. The adit was originally 900 ft long with a 110-ft winze (the winze and a stope were flooded at the time). The Lucky Star Mining Company was hand tramming and hand sorting the ore and shipping small lots to the Bunker Hill smelter in Idaho (1927). Another report listed the two adits as lower adit 530 feet to caved area, and the upper adit consisting of a 400-ft crosscut and about another 520 ft to a caved area. An excellent mine map is found as a plate in Crowley (1963).

Precambrian Ravalli quartzites and argillites hosted the mineralization; minor alteration was described. The adits explored the Blue Creek fault—a west dipping, NW-striking structure. Crowley (1963) described it as a shear zone with brecciated zones containing ore. Minerals found at the Blue Creek include galena, sphalerite, pyrite, and pyrrhotite with calcite and quartz gangue (Gibson, 1948). Lesser amounts of arsenopyrite, marcasite, and chalcopyrite were found.

## 2.12.3 Environmental Condition

The Blue Creek mine reflected the relatively recent nature of the workings. The upper adit had an adit discharge, and the waste dump was in contact with Blue Creek. Evidence pointed to the dump actively eroding during high water in the peak runoff times. The discharge from the adit infiltrated into the waste and a seep emerged adjacent to the creek. Blue Creek exhibited no adverse effects of the mining.

### 2.12.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream (BBCS20L) and downstream (BBCS10L) of the site on KNF-administered land. The flow rates at these two locations were approximately 2.0 cfs. The 20-gpm adit discharge was sampled (BBCS30L) as it passed onto KNF-administered land from the patented claim where the open adit was found. The seep at the toe of the waste dump also flowed approximately 20 gpm and was characterized by sample BBCS40L. Samples were collected on September 10, 1997. Site features and sample locations are shown in figure 11; photographs are shown in figures 11a and 11b.

### 2.12.3.2 Soil

One soil/waste sample was collected (BBCD10H). This sample was taken of the waste because it was in contact with Blue Creek.

Table 20. Soil sampling results at the Blue Creek mine (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (BBCD10H) | 1,000[1,2] | 36.6[1] | 307[1] | 5274[1,2] | 10,930[1,2] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).
(2) Exceeds phytotoxic levels (table 3).

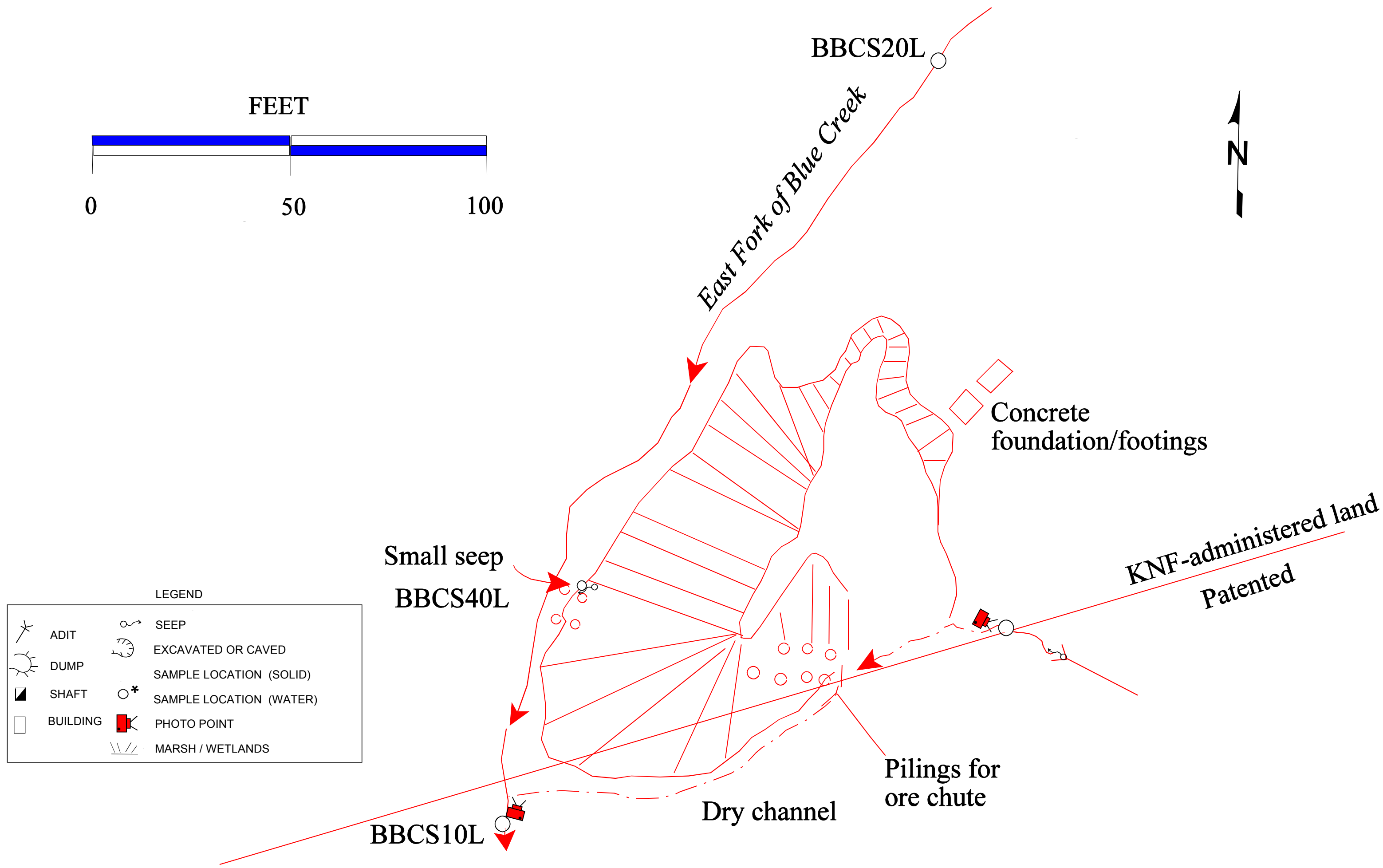


Figure 11. The Blue Creek mine discharged water into the top of the waste dump, and a seep emerged adjacent to the stream.

Figure 11a. The waste dump at the Blue Creek mine would be in contact with the creek during high water flow.

Figure 11b. The adit at the Blue Creek was open and accessible to the public, but it was on private land.

2.12.3.3 Water

The concentration of analytes in the upstream sample (BBCS20L) did not exceed any water quality standards (table 2). The downstream sample (BBCS10L) also did not exceed any standards. The seep at the toe of the waste dump did exceed the chronic aquatic life standard but only by two to three times the allowed limit. The adit discharge level in zinc did not come near the level found at the Broken Hill mine.

Table 21. Blue Creek mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBCS40L-upstream of north adit | | | | | | | | | | | | | | | | | | | |
| BBCS30 -adit discharge | | | | | | | | | | | | | | | | | | | |
| BBCS40 -seep | | | | | | | | C | | | | | | | | | | | |
| BBCS10 -downstream | | | | | | | | | | | | | | | | | | | |

Exceedence codes:

C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

2.12.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Healthy cedar, spruce and fir trees grew immediately adjacent to the waste dump. The adit and the discharge channel had lush vegetation growing up to the edge of the disturbance. The steep slopes of the waste dump were sparsely vegetated.

2.12.3.5 Summary of Environmental Conditions

The Blue Creek mine has an 20-gpm adit discharge, but the water quality was good. The upstream and downstream samples showed no exceedences. The only standard that was exceeded was the chronic aquatic life criteria in the small seep flowing from the base of the waste dump.

2.12.4 Structures

All structures were collapsed except for an ore bin at the south adit. The ore chute and bins depicted on Crowley's (1963) map are totally collapsed with only the pilings remaining. The remains of one cabin and a "Worthington" compressor was found at the south adit, but these were on private land.

### 2.12.5 Safety

The south adit was caved at the portal but did have a steep slope above it. The open adit at the Blue Creek mine was on private land so it was not evaluated. The waste dump was steep and unstable, especially at high water.

Table 22. Summary of sites in the upper Kootenai drainage. Sites in bold were sampled.

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| **Fortine Ranger District** | | | | | |
| Bluebird - See Also Green Mountain | Y | M | N | NE | Shallow workings and old cabin noted. Also D. Nesbitt; KNF states same. |
| Bonnett-Hoerner | N | M | N | NE | Screened out: barite; at south end of Lost Lake. |
| Gilbralter Ridge Mine | Y | N | N | Y | Small opening beyond caved portal. |
| Green Mountain | Y | N | N | NE | Only dry; shallow workings noted. |
| Hansen Prospect / Little Princess? | Y | N | N | Y | Nesbitt (KNF) open adit approx. 45 ft, no environmental problems. |
| **Independence** | **Y** | **N** | **Y** | **Y** | **Shallow workings; also one adit approx 30 feet deep -D. Nesbitt; KNF.** |
| Limestone Occurrence | N | P | N | NE | Screened out: limestone occurrence. |
| Moen | N | N | N | NE | Unable to locate; visited general area; trench only as described in Johns, 1970; p. 152. |
| **Nancy Jane Claims** | **Y** | **N** | **Y** | **Y** | **One small seep.** |
| **Peterson (Twin Peaks) Blacktail** | **Y** | **N** | **Y** | **NE** | **Nesbitt (KNF): adits filled with water and collapsing.** |
| Rex Mine / Jager Mine | Y | N | N | Y | Opening to mine has caved in leaving an opening into the tunneled mine shaft. D. Nesbitt- KNF. |
| **Rock Lake Adits** | **Y** | **N** | **Y** | **NE** | **One collapsed adit with a 1-gpm discharge.** |
| Schmitz Mine / Joshua Adit | Y | N | N | Y | The mine shaft is completely caved in and you have to look for the old adit to find it. |
| Swansea Rosa Lode Claim | Y | N | N | NE | No comments on field form. |
| Tetrault | N | N | N | NE | Visited general area; unable to locate. Johns (1961) reports a 25-ft adit in basalt at base of cliff. |
| Tobacco River Placer | N | P | N | NE | Screened out: placer also plots on private land. |
| Twin Peaks Prospect | N | N | N | NE | Screened out: general location in secs. 6; 13; 14. Commodity is Cu; accuracy is +/-1 km. |
| Unnamed Barium | N | M | N | NE | Screened out: barium. |
| Unnamed Barium | N | N | N | NE | Screened out: barite prospect; no references in MILS; accuracy +/-1 km. |
| **Libby Ranger District** | | | | | |
| Ada Prospect | N | M | N | NE | Screened out: no workings noted in Pardee and Larsen 1929. Prospect only. |
| American Kootenai | Y | M | N | Y | One open adit with trash on land of mixed ownership; 2 prospects. |
| Bear Creek Portal | Y | N | N | NE | Visited general area, could find no evidence of workings. |
| Bee and Zee | N | N | N | NE | May be in Cabinet Mountains wilderness; screened out; no workings. |
| Betty Mae | N | N | N | NE | Screened out: inaccurate location; no access and reference says shallow. |
| Big Chance Placer | N | P | N | NE | Screened out: only reference to this placer is MSHA report from 1981. |
| Big Cherry Creek Placer | N | N | N | NE | Screened out: placer; literature states that it wasn't worked since 1939. |
| Big Eight Placer | N | P | N | NE | Screened out: placer; no record of production; mostly; if not all; private. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Big Sky / Montana Silver-Lead | Y | N | N | NE | One caved adit found downhill from trail. Other 1200' adit could not be located. |
| Bolyard Placer/Vaughan& Greenwell | N | M | N | NE | Screened out: placer. |
| Bonus Claim | N | N | N | NE | Screened out: no access; no references in MILS; lead; copper occurrence. |
| Boulder Hill (Hope & Boulder Hill) | N | M | N | NE | Screened out: unable to locate. |
| **Bramlet Creek Mill** | **Y** | **M** | **Y** | **NE** | **Tailings reported along creek.** |
| Branagan / Brannigan / Fisher Creek | Y | P | N | Y | Mostly private; no tailings noted-may have been washed away. |
| Cableway Group | N | N | N | NE | Screened out: only one reference in literature; inaccurate location. |
| **Cherry Creek Mill Site** | **Y** | **N** | **Y** | **Y** | **Streamside tailings.** |
| Comet Placer | N | M | N | NE | Screened out: placer; probably mostly private. |
| Copper Mountain | N | M | N | NE | Screened out: private?; no references except a mineral property file; accuracy of +/-1 km. |
| Copper-iron Occurrence | N | M | N | NE | Screened out: no references in MILS data base.; inaccurate location.; unnamed occurrence. |
| Copper-silver-iron Occurrence | N | M | N | NE | Screened out: occurrence only; no references; private?; accuracy +/-1 km. |
| **Copper Reward / Walker Group** | **Y** | **N** | **Y** | **NE** | **One adit with small discharge flow. Never reaches creek.** |
| Cow Creek | N | M | N | NE | Screened out: placer; may be private; no references in MILS. |
| Crater | N | M | N | NE | Screened out: inaccurate location, 100' adit only (in 1948). |
| Cu-Pb-Fe-Mn Occurrence | N | M | N | NE | Screened out: inaccurate location (+/-1 km). Unnamed occurrence. No references in MILS. |
| D. & W. Group | N | M | N | NE | Visited general area; no workings noted; access through private land. |
| Darling Placer | N | N | N | NE | Screened out: placer; workings only pits and trenches. |
| Denver No. 1 & 2 | N | N | N | NE | Unable to locate. No description in literature. |
| Diamond John | N | M | N | NE | Ownership unknown; patented claims in area.; part of Montanore project? ; screened out. |
| Dome Mine | N | N | N | NE | Screened out. |
| Double Mac | Y | N | N | NE | Collapsed adit bearing N37EW; dry; next to road. |
| Fairbault | N | N | N | NE | Unable to locate. No signs of workings south of Cherry Creek. Unlikely to influence. |
| Fisher River Property | N | M | N | NE | Screened out: placer; accuracy +/-1 km. |
| Fisher River Quarry | N | P | N | NE | Screened out: quarry; no references; commodity listed as gold/silver. |
| Ford Placer | N | M | N | NE | Screened out: placer; but visited Midas and general area; no effects to KNF land. |
| Fourth of July | N | M | N | NE | Small mill on Fourth of July Creek burned in 1909; workings on private ground. |
| Getner Placer | N | P | N | NE | Screened out: placer; on private land. |
| Golden Bear | N | N | N | NE | Screened out: open cuts only (Gibson, 1948). |
| Golden West' Mine, "New" Mine | Y | N | N | Y | Three open adits; one caved. Seasonal discharge but dry when visited. |
| Gold Hill Group, Gold Hill Claims | N | M | N | NE | Screened out: Gold Hill group is same as Viking Mine. |
| **Glacier Ag-Pb/Hazel T./Lukens** | **Y** | **P** | **N** | **NE** | **Private: sampled downstream on adjacent to road.** |
| **Gloria** | **Y** | **N** | **Y** | **Y** | **Three openings; small waste dump in flood plain.** |
| Granite Concrete Pit and Plant | N | P | N | NE | Screened out: concrete plant; non-metallic. |
| Granite Creek/Mountain Rose | Y | N | N | Y | Open adit. |
| Grizzly / Missouri Group | N | N | N | NE | Unable to locate; drove road up Leigh Creek but couldn't spot mine workings. Burn area. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Halfmoon | N | N | N | NE | Screened out: prospect only, no production noted. |
| Hannegan / Libby | Y | M | N | NE | Five short adits all caved; may be partially on national forest. |
| Harry Howard Placer | N | N | N | NE | Screened out: placer; only one reference to occurrence. |
| Hathaway | Y | N | N | Y | Partially open adit; 2 feet by 3 feet. |
| Heintz R a Construction | N | P | N | NE | Screened out: commodity listed as quartzite dimension stone; private? |
| Herbert Group | Y | M | N | Y | Two open holes; one inclined; one vertical (B. Lacklen; KNF). |
| Horse Hill | N | M | N | NE | Screened out: unable to locate; (Johns 1962) wrote that a winze in the adit was filled with water. |
| Howard Creek Claim | N | M | N | NE | Screened out: inaccurate location; probably placer; may be duplicate. |
| Hoyt (North Star Group) | Y | M | N | Y | Open inclined shaft. |
| Illinois-Montana Group | N | P | N | NE | Screened out: private, 2 patented lode claims & 1 placer. |
| Indian Head Tungsten | N | N | N | NE | Bannister et al. (1981) states that there are no workings here. WO3 and moly prospect. |
| Irish Boy and Rambler | Y | M | N | Y | Adits almost totally caved - 2' opening; little sign of adits remain, except an overgrown road. |
| Iron Occurrence | N | N | N | NE | Screened out: unnamed iron occurrence; no site visit; outcrop only. |
| Iron Occurrence | N | N | N | NE | Screened out: no workings reported; occurrence only. |
| Iron-copper Occurrence | N | N | N | NE | Screened out: inaccurate location; unnamed iron-copper occurrence; no references in MILS. |
| Iron-phosphate Occurrence | N | M | N | NE | Screened out: no references in MILS; inaccurate location (+/-1 km); only an occurrence. |
| John Bull-Uncle Sam Mine | Y | N | N | NE | 250' adit on Bear Creek at junction with Cable Creek. One collapsed adit located. |
| Joseph Prospect | N | N | N | NE | Screened out: inaccurate location; also private. |
| Jumbo Mine (Formerly Tip Top) | Y | N | N | Y | Three open adits; all locked & gated with chainlink. 2 partly open adits. |
| Kenelty Mine | N | P | N | NE | Screened out: private land, Plum Creek timber, inc. |
| Kennedy | N | N | N | NE | Screened out: surface bulldozer cuts only; inaccurate location. |
| **King / Silver Butte** | **N** | **M** | **Y** | **NE** | **Drove to private property boundary: no access. Sampled downstream only.** |
| Kirkpatrick | N | P | N | NE | Screened out: private with little or no effects on forest. |
| Last Chance Group / Poston Group | N | P | N | NE | Screened out: private; vermiculite deposit. |
| Leigh Creek | N | N | N | NE | Unable to locate. |
| Libby Creek Gold Mining Co. | N | M | N | NE | Screened out: placer; inaccurate location. |
| Libby Pit | N | N | N | NE | Screened out: gravel pit; MILS listed as processing plant. |
| Libby Creek Placer | N | M | N | NE | Screened out: placer; mostly private. |
| Libby Prospect (See Hannegan) | Y | M | N | NE | See Hannegan (Johns; 1970; MBMG Bulletin 79; p. 108). |
| Libby Sand and Gravel Pit | N | P | N | NE | Screened out: sand and gravel pit; non-metallic; plots on private land. |
| Limestone Occurrence | N | N | N | NE | Screened out: limestone occurrence; no references in the MILS data base. |
| **Loyal** | **Y** | **N** | **Y** | **NE** | **Small discharge ponds up south of portal.** |
| Lukens-Hazel Upper Adits | Y | P | N | NE | Plum Creek land; at least three caved adits. |
| Lucky Mac Group | N | M | N | NE | Screened out: location inaccurate; no significant workings noted in literature. |
| Lynx Creek | N | N | N | NE | Screened out: talc prospect only; no references in the MILS data base. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Mastodon (Barbara Claims) Kavalla | N | N | N | Y | Screened out: active in 1998; open shaft with timbers according to B. Lacklen; KNF. |
| Midas Mine / Rose Consolidated | Y | M | N | NE | All adits caved; mill site present but no identified tailings or waste in flood plain. |
| Miller Placer | N | N | N | NE | Screened out: placer; see description in Johns, 1970; MBMG Bulletin 79; p. 82. |
| Missouri (See Grizzly LN006170) | N | N | N | NE | Screened out: duplicate. |
| Montanore Adit | N | M | N | NE | Screened out: still permitted; but at present is idle. |
| Montanore Project Adit & Plant Site | N | M | N | NE | Screened out: project still permitted; but at present is idle. |
| Montezuma / Hallalujah | Y | N | N | NE | Is possibly connected with the Silvertip (Shaw's) collapsed adit and a few trenches here. |
| Montana Placer | N | M | N | NE | Screened out: placer; only one reference in MILS. |
| Mountain Rose | Y | N | N | Y | Open adit on hillside; followed cable up from valley bottom. Standing water inside adit. |
| Mustang or Nethercutt's Mine | Y | N | N | Y | Active mine but no activity at the time of this visit. Claimant is Nethercutt (sp?) |
| Nancy | N | M | N | NE | Screened out: no site visit; no references in MILS; possibly private; accuracy +/-1 km. |
| Napoleon Prospect | N | M | N | NE | Screened out: inaccurate location; +/-1 km; no references in MILS. |
| Nugget Placer | N | P | N | NE | Screened out: private; placer. |
| Olsen & Switzer | N | M | N | NE | Screened out; one caved adit; four trenches; two dozer cuts (Banister et al., 1981). |
| Potter | N | P | N | NE | Screened out: totally private; no effect to forest lands. |
| Raven | N | M | N | NE | Screened out: no workings reported in literature; location inaccurate. |
| Red Gulch Placer | N | M | N | NE | Screened out: placer and pits only; mostly private. |
| Remp (Silver Ghost) | N | N | N | NE | In Cabinet Mountains wilderness. |
| Seattle | N | N | N | NE | Screened out: no workings described in literature. Just west of Copper Reward. |
| Seclusion (A.C. Lewis) | Y | N | N | NE | Reclamation in progress 7/29/98; on Miller Creek. |
| **Shaughnessy Creek Adit** | **Y** | **N** | **Y** | **NE** | **Small discharge ponds in a mucky puddle south of portal.** |
| Silver Cable (Prospect) | N | M | N | NE | Screened out: inaccurate location, 4 adits - all inaccessible in 1970 (Johns, 1970). |
| Silvertip (G.E. Shaw) | Y | N | N | NE | Two lower adits caved behind wooden door portals. Possibly Montezuma ? Gibson, 1948 |
| **Silver Mountain Group** | **Y** | **N** | **Y** | **Y** | **Mill at site partially collapsed.** |
| Silvertip Group / O. A. Howard | Y | N | N | NE | South of Snowshoe mine; unpatented claim. Workings viewed from Big Cherry Creek. |
| Silver Tip (G.E. Shaw) | Y | N | N | NE | Two lower adits caved behind wooden door portals. Possibly Montezuma ? Gibson 1948. |
| **Snowfall Prospect** | **Y** | **N** | **Y** | **NE** | **Adit discharge.** |
| **Snowshoe Grp/Snowshoe Quartz** | **Y** | **M** | **Y** | **NE** | **Pioneer Technical Services report (1995); tailings and waste in flood plain.** |
| Statesman | N | N | N | NE | Screened out: prospect only; inaccurate location (Johns 1970; p.97). |
| St. Anthony | Y | P | N | NE | Private; locked portal; dry. Two mine buildings. On Kootenai River road. |
| St Paul /Zollars/ Fern/Faith/Topsy | Y | N | N | Y | At least two open adits with doors. Lower one not locked. Upper one also accessible. |
| Strodtbeck | N | N | N | NE | Screened out: workings reported to be a 10-foot discovery shaft/ pits & trenches. |
| Sunrise | N | N | N | NE | Screened out: inaccurate location; 15 shallow cuts (Gibson, 1948). |
| Texas Ranger Group | Y | N | N | NE | Observed from valley; no disturbances visible. Claim map in Johns (1970). |
| Tideman Placer | N | P | N | NE | Screened out: placer; land mostly private. |
| Union Group - Ismore/Evening/ | Y | M | N | NE | 8 patented claims; caved adits of unknown ownership; may be on forest. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Unnamed Aluminum | N | N | N | NE | Screened out: unnamed aluminum deposit. |
| Unnamed Asbestos | N | P | N | NE | Screened out: private; part of the Vermiculite Mountain property. |
| Unnamed Barite | N | P | N | NE | Screened out: no references in MILS, private. |
| Unnamed Calcite | N | M | N | NE | Screened out: commodity calcium; no references in MILS; inaccurate location. |
| Unnamed Chlorite & Sericite | N | N | N | NE | Screened out: mica deposit; unnamed occurrence. |
| Unnamed Copper, Lead & Silver | N | M | N | NE | Screened out: inaccurate location; no references in MILS. |
| Unnamed Copper | N | M | N | NE | Screened out: no references in MILS; accuracy of +/-1 km; occurrence only. |
| Unnamed Copper | N | P | N | NE | Screened out: private; prospect only (6-ft pit); inaccurate location. |
| Unnamed Copper | N | M | N | NE | Screened out: no references in MILS; unnamed occurrence; inaccurate location. |
| Unnamed Copper | N | N | N | NE | Screened out: prospect only; flooded by Libby dam (?) |
| Unnamed Feldspar & Mica | N | M | N | NE | Screened out: inaccurate location; in secs. 16;21;22;27 & 28 according to MILS. |
| Unnamed Gold | N | P | N | NE | Screened out: no references in MILS; private. |
| Unnamed Gold | N | M | N | NE | Screened out: no references in MILS; inaccurate location; unknown ownership. |
| Unnamed Gold & Silver | N | P | N | NE | Screened out: |
| Unnamed Gold & Silver | N | P | N | NE | Screened out: no references in MILS data base; unnamed deposit. |
| Unnamed Gold & Silver | N | P | N | NE | Screened out: inaccurate location; no references in MILS; and probably private. |
| Unnamed Gold & Silver | N | N | N | NE | Screened out: no references in MILS; unnamed deposit; +/-1 km accuracy. |
| Unnamed Limestone | N | M | N | NE | Screened out: limestone occurrence. |
| Unnamed Lead & Zinc | N | N | N | NE | Screened out: no references in MILS; accuracy of +/-1 km; unnamed deposit. |
| Unnamed Quartz | N | M | N | NE | Screened out: in the office; qtz crystal prospect according to MILS; no other references. |
| Unnamed Silver, Lead & Copper | N | M | N | NE | Screened out: inaccurate location; no references in MILS; may be private? |
| Universal Zonolite Corp. Property | N | P | N | NE | Screened out: private; same as Vermiculite Mountain mine; LN006190. |
| **Vermiculite Mountain Mine** | **Y** | **M** | **Y** | **NE** | **Sampled upstream and downstream of private land.** |
| **Victor-Empire** | **Y** | **N** | **Y** | **Y** | **Discharge sinks into waste dump, one open adit.** |
| **Viking Mine / Gold Hill Claims** | **Y** | **N** | **Y** | **Y** | **Adit discharge.** |
| Waylett North Prospects | Y | N | N | NE | Walked down to these prospects; one fairly steep highwall; rest are trenches. |
| Waylett Group / Moose Hill / Royal | Y | N | N | NE | Unable to locate; walked general area where mine was plotted on topo; but could not find. |
| Wayup Mine / Way up | Y | P | N | NE | All disturbances private; four open adits w/ discharges. |
| Williams | Y | N | N | NE | Visited trenches on top of ridge; did not find adits. Reportedly G. Shaw had an open portal. |
| Wolf Creek Placer | N | P | N | NE | Screened out: mostly; if not all; private. Placer. |
| Wollastonite Veins | N | N | N | NE | Screened out: commodity silicon; no workings present. |
| Zonolite Mine | N | M | N | NE | Screened out: accuracy +/-5 km; non-metallic Vermiculite mine. |
| **Rexford Ranger District** | | | | | |
| Big Creek | Y | N | N | Y | One open adit with seep only; did not sample. |
| Big Creek Extension | N | N | N | NE | Visited general area; location inaccurate; unlikely to affect forest. |
| Copeland | N | N | N | NE | Screened out: placer and prospect; adit was 40 to 60 feet long and caved in 1961. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Iron Occurrence | N | N | N | NE | Screened out: no references in MILS; accuracy of +/-1 km. |
| Kenelty | N | N | N | NE | Screened out: roadcut with veins only (Johns, 1961). |
| Kootenai River Placer | N | N | N | NE | Screened out: placer; flooded by reservoir. |
| Mc Guire Prospect | N | N | N | NE | Screened out: no references in MILS; only an Ag; Cu; Pb prospect. |
| Stonehill Placer | N | N | N | NE | Screened out: placer; last worked in the 1930's. May be private? Although maps show it as forest. |
| Unnamed Copper | Y | N | N | NE | Two prospect pits and two trenches. |
| Unnamed Galena | N | P | N | NE | Screened out: galena discovered in a well on the Jim Meeker ranch (Johns, 1961) no workings. |
| Unnamed Galena, Cu & Silver | N | N | N | NE | Screened out: sample taken from skid trail. |
| Unnamed Silver, Gold & Copper | N | N | N | NE | Screened out: no references in MILS; accuracy of +/-1 km. |
| Valley View Claim/ J.B. Claim | N | N | N | NE | Screened out: +/-1 km accuracy; no references in mils; lead-zinc prospect. |
| **Three Rivers Ranger District** | | | | | |
| American Eagle | Y | N | N | NE | No effects, one 200' adit, caved, hearty vegetation. |
| Asarco Tailings Pond | N | P | N | NE | Screened out: private; current operating permit. |
| Barite Prospect | N | M | N | NE | Screened out: barite - mislocated. |
| Bear | N | S | N | NE | Screened out: dry ridgetop; state land. |
| Big Eight | Y | P | N | NE | See Snowshoe claim for upstream / downstream water sample. |
| Big Four | N | M | N | NE | Unable to locate. |
| Bimetallic / Black Horse | N | M | N | NE | Screened out: ridgetop location (dry); unknown ownership. |
| Black Diamond | Y | M | N | NE | Literature said glory hole; and four adits but unable to locate except for one adit. |
| Blacktail | N | M | N | NE | Unknown ownership; unable to locate. |
| Cabinet | N | M | N | NE | Unknown ownership; unable to locate. |
| Cabinet Queen Prospect | Y | P | N | NE | No disturbance visible. |
| Callahan Creek Placer | N | M | N | NE | Screened out: placer mine; unknown ownership. |
| China Creek | N | N | N | NE | Screened out: placer; inaccurate location; no references in MILS. |
| Christmas Tree Mine | N | S | N | NE | Screened out: on dry ridgetop - state land. |
| Condor Mining & Leasing | N | N | N | NE | Screened out: placer. |
| Copper Mountain Mine | N | P | N | NE | Screened out: private; no effect; barite. |
| Crescent Tunnel | Y | M | N | NE | Unable to locate this; it is mislocated; visited area. |
| Daniel Lee / Daniel Lee Vein | N | N | N | NE | Screened out: prospect only; location from Hayes; 1984. Part of Troy mine project. |
| Duplex / Sugar Queen | N | N | N | NE | Screened out: inaccurate location 1 or 2 adits; partly collapsed in 1959, Dahlem, 1959 |
| Fairway Creek Prospect | N | N | N | NE | Screened out: prospect only; from Hayes (1984). |
| Ferrel | N | N | N | NE | Unable to locate; inaccurate location. Literature says west of Yaak road but S-T-R is east. |
| **Giant Sunrise / Montana Sunrise** | **Y** | **N** | **Y** | **Y** | **Waste in floodplain, flooded adit.** |
| **Goat Creek Adit** | **Y** | **N** | **Y** | **NE** | **Small waste dump in contact with creek.** |
| Gold Flint-Key Stone | N | M | N | NE | Screened out: disturbances on patented land. Also in section 17. See also Morning Glory mine. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Great Northern Property | N | M | N | NE | Unable to locate. |
| Grouse Creek | Y | N | N | Y | One open adit, standing water inside, no flow. |
| **Grouse Mountain** | **Y** | **P** | **Y** | **NE** | **Adit discharge.** |
| Hiawatha | Y | P | N | NE | Covered by talus. |
| **Iron Mask** | **Y** | **M** | **Y** | **NE** | **Adit discharge. Open adits on private.** |
| JF Prospect | N | N | N | NE | Screened out: prospect only; reference from Hayes (1984). |
| John Francis Claims | N | N | N | NE | Screened out: no site visit; no references in MILS. |
| Keeler Mountain | N | M | N | NE | Unable to locate; unknown ownership. |
| Kotschevar Barite | N | N | N | NE | Screened out: barite mine - no visit. |
| Last Chance | Y | N | N | NE | Caved adit, dry. |
| Liberty Metals | N | P | N | NE | Screened out: private with no effect on KNF-administered land. |
| Limestone Occurrence | N | P | N | NE | Screened out: limestone occurrence; private. |
| Little Spokane | N | M | N | NE | Screened in office: dry ridgetop - part of Grouse Mountain property. |
| Lost Cause Mine | Y | M | N | NE | Visited general area, may have been caved shaft. |
| Milton Group | N | P | N | NE | Screened out: private with no effect on KNF-administered land. |
| Montana Morning | N | N | N | NE | Screened out: active. |
| Montana Premier Mine | N | P | N | NE | Screened out: barite mine - operating permit. |
| New Morning Glory/Haywire Mining | Y | M | N | Y | Water standing in the adit and small shaft with standing water. Water not accessible to sample. |
| Oro-Highland / Highland Silver | N | N | N | NE | Screened out: location inaccurate; two adits; references Johns, 1970 and Young et al., 1962. |
| Rankin | N | M | N | NE | Screened out: prospect only. |
| Second Chance / McGuire Property | N | N | N | NE | Screened out: inaccurate location, p. 119, Johns (1970). 600' adit, 40' adit & a pit. |
| Silver Grouse | Y | N | N | Y | Open adit. Dump has been eroded away by creek. One cabin good condition. |
| Silver King | Y | N | N | NE | Caved and dry adits with vegetated dumps. |
| Silver Strike | Y | M | N | NE | Part of Grouse Mountain mine. |
| Snipetown Placer | N | N | N | NE | Screened out: placer; on Yaak river. See Dahlem, 1959 for reference. |
| **Snowstorm / B. and B.** | **Y** | **P** | **Y** | **Y** | **Tailings and waste mostly washed away by floods.** |
| Spar Lake / Spar Lake Copper | N | N | N | NE | Screened out: surface prospect only (Johns; 1970). |
| **Sunrise Mill** | **Y** | **P** | **Y** | **NE** | **Sampled downstream on KNF-administered land.** |
| Sylvanite Mill / Keystone Group | Y | M | N | NE | Mixed ownership; mill could be a hazardous structure. No tailings noted in floodplain. |
| Trio | N | N | N | NE | Screened out: inaccurate location; no access. |
| Troy Proj - Man-way & Conveyor Adit | N | M | N | Y | Screened out: Spar Lake still considered active (under care and maintenance) 1997. |
| Troy Proj. - North Adits | N | M | N | Y | Screened out: part of Troy mine / Spar Lake project; still under care & maintenance. |
| Troy Proj. - South Adit | N | M | N | Y | Screened out: part of Troy / Spar Lake project. Still active (care & maintenance; 1997). |
| Troy Project/ Spar Lake | N | M | N | NE | Screened out: Troy mine surface plant & offices (Hayes, 1984). |
| Unnamed Clay | N | N | N | NE | Screened out: unnamed clay deposit; little or no impact. |
| Unnamed Talc | N | N | N | NE | Screened out: unnamed talc occurrence; bulldozer cut only. |

| NAME | VISIT | OWNER | SAMPLE | HAZARD | REMARKS |
|---|---|---|---|---|---|
| Unnamed Uranium | N | M | N | NE | Location inaccurate. |
| Universal | Y | P | N | NE | All workings covered by slumping; except for open cut. |
| Weyerhaeuser | N | M | N | NE | Unknown ownership; unable to locate. |
| Woods Mine | N | N | N | NE | Screened out: inaccurate location; no access to site; no references in mils database. |
| Yaak Falls | N | N | N | NE | Unable to locate. Visited general area. May have been obliterated in road building? |

1) Mines in **bold** may pose environmental problems and are discussed in the text; others are included only in appendix II (all mines) and appendix III (short write-ups for each site).
2) Administration/Ownership Designation
N: KNF-administered land
P: Private
M: Mixed (KNF-administered land and private)
S: State of Montana
U: Owner unknown
3) Solid and/or water samples (including leach samples).
4) Y: Physical and/or chemical safety hazards exist at the site.
NE: Physical and chemical safety hazards were not evaluated.
5) Mill site present.

## 2.13 Rock Lake Adit

### 2.13.1 Site Location and Access

The Rock Lake adit is located on the south end of Rock Lake in the Tobacco River drainage. It is in DBCB section 06 T35N, R26W on the Eureka South 7.5-min. quadrangle at an elevation of 2,950 ft. The adit is approximately 150 ft southeast of Forest Road 3688 as it splits from Forest Road 3683, which leads to Lost Lake and Timber Lake. An inconspicuous two-track road lead to the adit to the southeast.

### 2.13.2 Site History-Geologic Features

No references to the Rock Lake adits were noted in literature. It may be the same as the Bonnett-Horner that was listed in the same section by Johns (1961, plate 1). It was worked in 1958. The description doesn't quite match in that the adit that this study looked at was not in Purcell basalt but rather in a buff to tan argillite (Precambrian Piegan Group ?). The geologic map (Johns, 1961) shows a NE-trending fault cutting through this area with Piegan Group to the west and Missoula Group to the east with Purcell basalt between the two.

The adit trends S54°E. There was an open cut uphill and to the south of the adit. The Bonnett-Horner as described in Johns was a barite prospect.

### 2.13.3 Environmental Condition

This was a small disturbed area but is very close to Eureka and the recreational area near the surrounding lakes. The discharge has a small flow, and the flow never reaches the active drainage or the lake via the surface. The commodity was probably barite.

### 2.13.3.1 Site Features-Sample Locations

A water-quality sample was collected from the adit discharge (RRLS10L) on KNF-administered land. The flow rate at this location was less than one gpm. The sample was collected on September 29, 1998. Site features and sample locations are shown in figure 12; photographs are shown in figures 12a and 12b.

### 2.13.3.2 Soil

No soil samples were collected. No evidence of any solids contributing metals to the surrounding area was noted.

### 2.13.3.3 Water

The concentration of analytes in the adit discharge sample (RRLS10H) did not exceed any water-quality standards (table 2). The pH was 7.76 and the SC was 441 μhos/cm. No evidence of metals precipitation was noted.

Table 23. Rock Lake adit water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RRLS10H-adit discharge | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

### 2.13.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Grasses grew in the adit-discharge channel. The adit had grasses and shrubs growing adjacent to the portal.

### 2.13.3.5 Summary of Environmental Conditions

This is a small site and had few or no signs of any environmental degradation caused by previous mining activities.

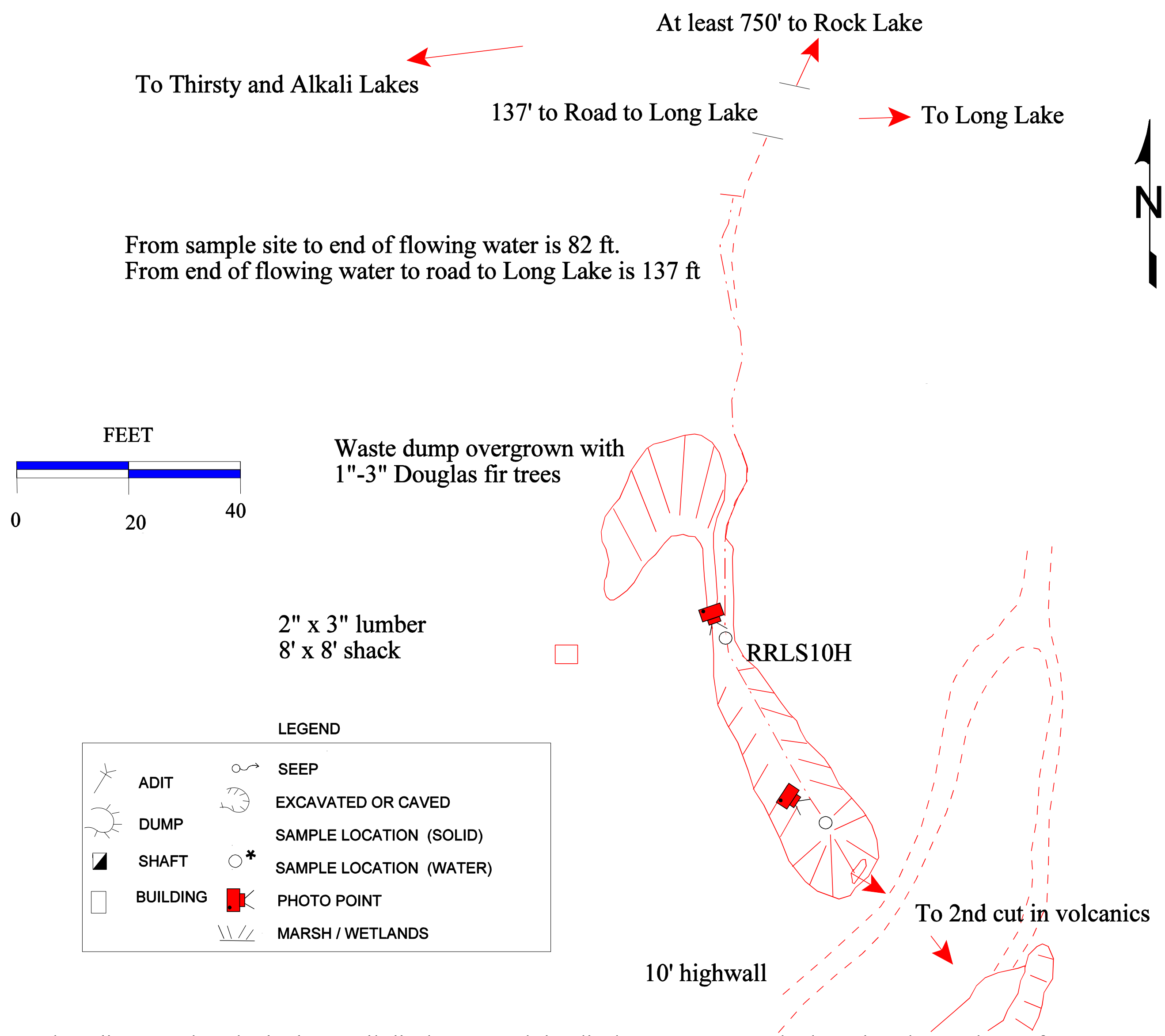


Figure 12. The adit at Rock Lake had a small discharge, and the discharge never reached Rock Lake on the surface, as mapped 09/30/98.


Figure 12a. The adit near Rock Lake was predominantly caved with a small rate discharge flowing from the caved portal.


Figure 12b. The small rate flow at Rock Lake was measured as it flowed from the adit and was captured by a short piece of PVC pipe.

2.13.4 Structures

One cabin in good condition was made of 2" by 3" lumber. It appeared as if it was recently built. The roof was still on it.

2.13.5 Safety

The site had a small crawl space into the old workings but was almost completely caved. There was a 10-ft highwall at the portal that was downhill from the upper road leading to an open cut.

## 2.14 Nancy Jane and Twin Peaks Mines

### 2.14.1 Site Location and Access

The Nancy Jane and Twin Peaks mines are located in the Ten Lakes scenic area on the Ksanka Peak 7.5-min. quadrangle. The Nancy Jane is in DBBC section 14, T37N, R26W at 6,660 ft elevation and the Twin Peaks mine is in DDDA sec. 14, T37N, R26W, at an elevation of 7,060 ft. They both are in an intermittent drainage flowing northwest to Blacktail Creek. The Twin Peaks mine is labeled as such on the topographic map but is also known as the Peterson property (Johns, 1961). Whipple et al. (1983) listed alternate names of the Twin Peaks mine as the Red Bird, Midnight, and Copper Kettle (formerly patented claims) and the Eureka (unpatented). The Nancy Jane's name was found on a location notice at the site. The sites are now entirely on KNF-administered land.

### 2.14.2 Site History-Geologic Features

The Twin Peaks mine was located in 1900 by Gus Peterson (Johns, 1961) as a copper prospect. It was explored by a 30-foot shaft, a 220-foot upper adit, a 300-foot to 400-foot center adit, and a 300-foot lower adit. Ore minerals included primarily chalcopyrite, malachite, hematite, barite, and calcite (Johns, 1961). The primary focus of exploration was on the copper-bearing Purcell lava veins that contain quartz-barite-siderite (Whipple and others, 1983). No production was noted from this property. The mines were in the Purcell basalt (lava). Whipple and others (1983) stated that the British Columbia Copper Company evaluated the area in 1912 but had lost interest in the area by 1920.

### 2.14.3 Environmental Condition

These mines appeared to be a fairly significant mining area from the number of mine symbols on the map. Most disturbances were small, isolated workings. The Purcell lava hosted most of the deposits and most had minor sulfide occurrences.

2.14.3.1 Site Features-Sample Locations

Water-quality samples were collected at the Nancy Jane from a seep at the toe of the waste dump (BNJS10M) and at the Twin Peaks mine a sample was collected from a seep at the toe of its waste dump. At the Nancy Jane, pH was 7.52 and specific conductance was 121 μmhos/cm. At the Twin Peaks, pH was 8.13 and specific conductance was 103 μmhos/cm. Samples were collected on October 14, 1997. Site features and sample locations are shown in figure 13; photographs are shown in figures 13a and 13b.

2.14.3.2 Soil

Soil samples were not collected.

2.14.3.3 Water

The concentrations of analytes in neither of the samples exceeded any water-quality standards (table 2). The flows were one gpm at the Nancy Jane and two gpm at the Twin Peaks mine.

Table 24. Nancy Jane and Twin Peaks mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNJS10M-seep at Nancy Jane | | | | | | | | | | | | | | | | | | | |
| BTPS10M-seep at Twin Peaks mine | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

2.14.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site.

2.14.3.5 Summary of Environmental Conditions

All impacts at the two sites were restricted to local, physical disturbance with no negative environmental effects.

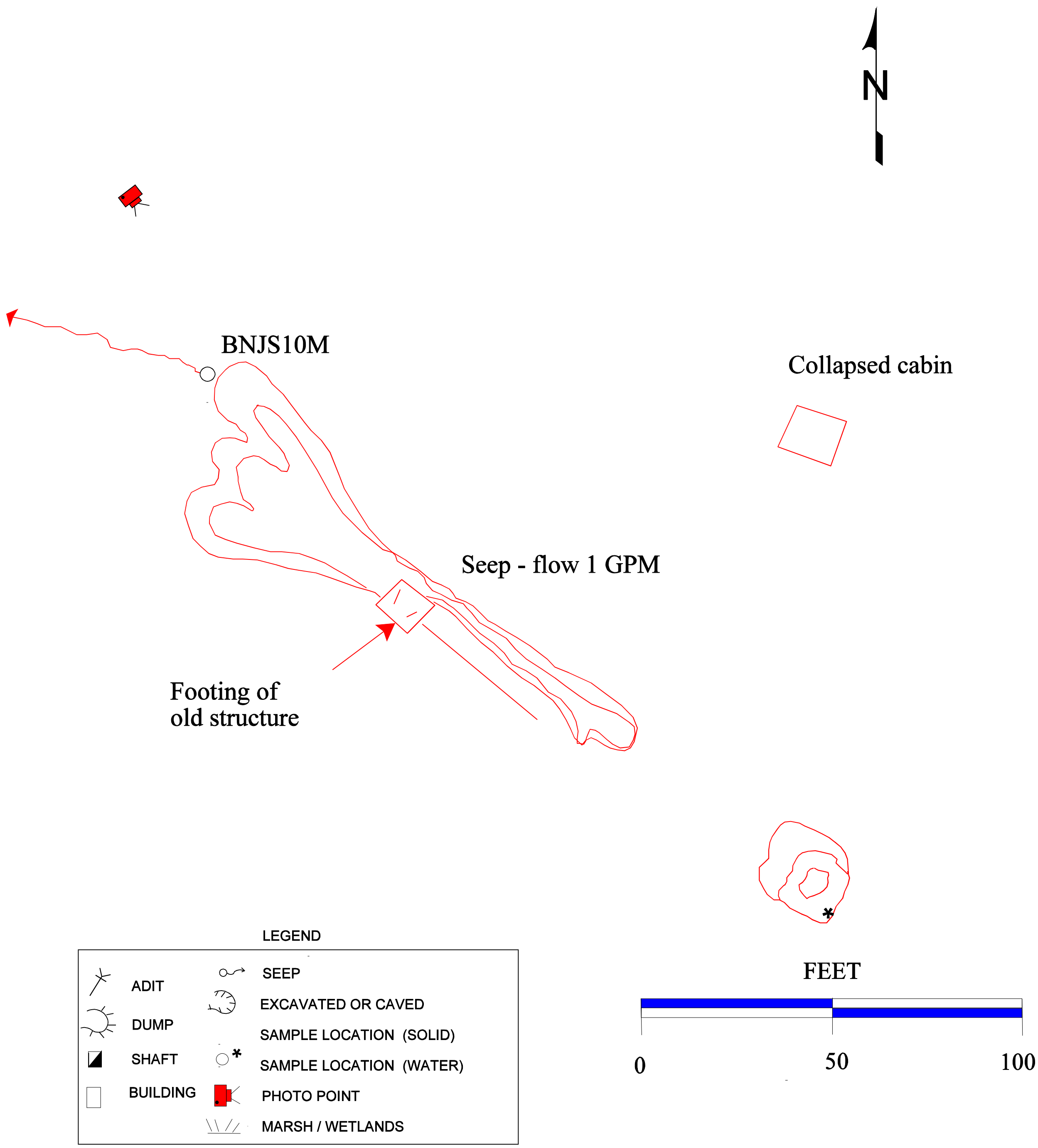


Figure 13. The Nancy Jane mine had a one-gpm discharge.

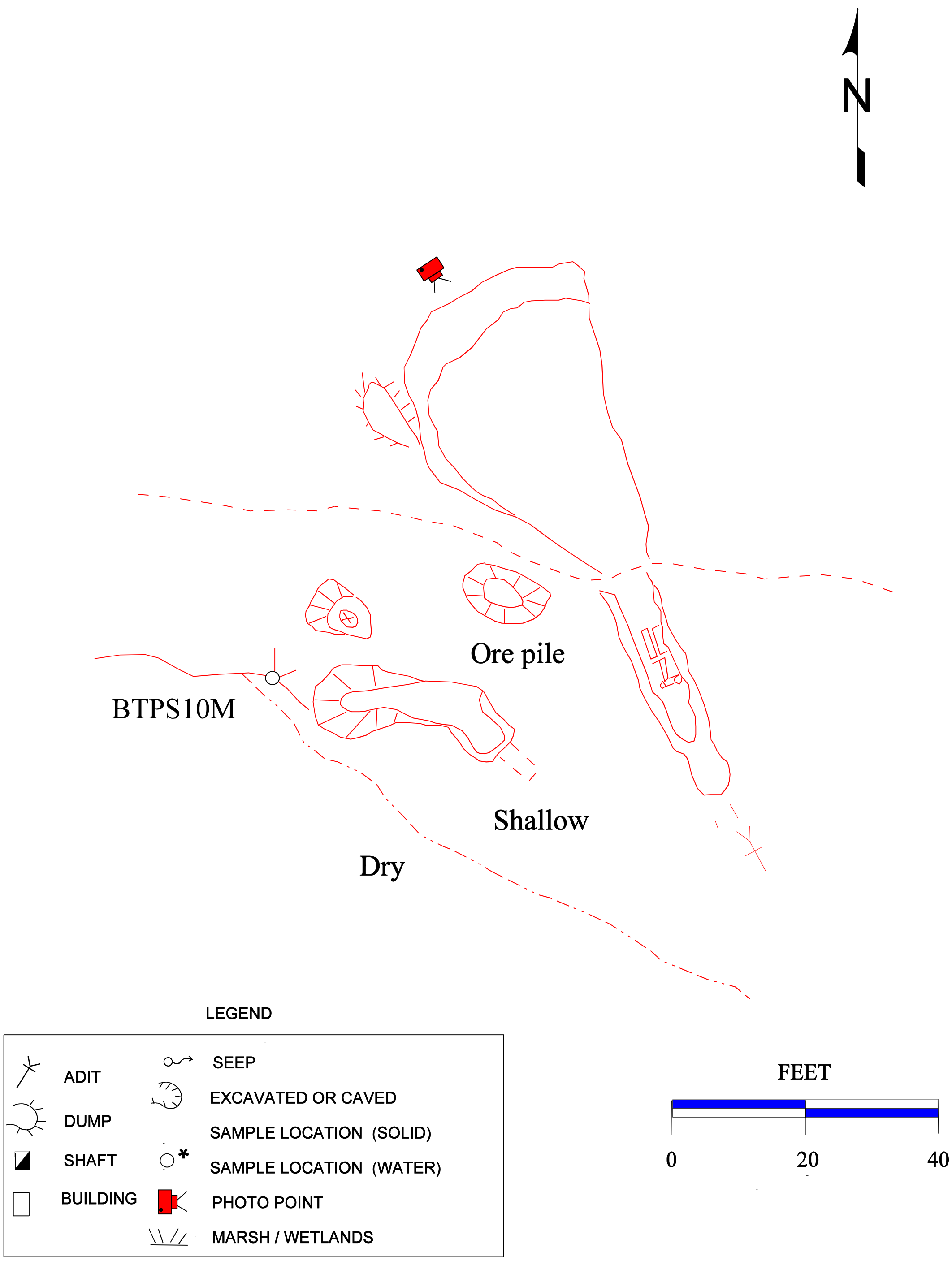


Figure 14. The Twin Peaks mine discharged a small amount of water.


Figure 14a. The Nancy Jane mine had a small seep to the right of the photo.


Figure 14b. The Twin Peaks mine showed no adverse effects and was largely naturally reclaimed.

2.14.4 Structures

One collapsed cabin was found at the Nancy Jane, but no structures were found at the Twin Peaks mine.

2.14.5 Safety

The sites had no safety concerns.

## 2.15 Independence Mine

2.15.1 Site Location and Access

To reach this site from Eureka, travel north on Highway 93, 3.2 miles to Forest Route 1001 then approximately two miles to road 864 and then east on a private road to Trail 340. This site is reached by foot trail (Forest Service Trail 340) approximately two steep miles up Indian Creek northeast of Eureka. The road is closed approximately six miles from Eureka and permission of at least three landowners must be obtained before crossing the private land in section 29. An alternate route is by hiking from the east on Trail 83 from the Ten Lakes scenic area.

The formerly patented claim is in CADA section 22, T37N, R26W on the Ksanka Peak 7.5-min. quadrangle. It lies approximately ½-mile west of the Ten Lakes scenic area. The workings are on KNF-administered land in the Fortine Ranger District. The patented claim was purchased by the USFS in the early 1990's (1992 or 1993) as a part of the Ten Lakes Wilderness Study Area (Ed Monnig, District Ranger, Fortine Ranger District, personal communication, 1999). The adits lie at 6,220 ft and 6,450 ft elevations, a climb of almost 2,700 ft from the beginning of the trail. The trail has been recently maintained except for the last quarter mile.

2.15.2 Site History-Geologic Features

The mine is one of the larger in the area and is considered a copper property. It was located in 1892 by Edward Boyle (Johns, 1970) and other names associated with the property include the Dickie Lode, Safety Lode, Pearl (formerly the Little Willie), Liberty, and National Lode. The Anaconda Copper Mining Company showed an interest in the Independence in 1907 (Whipple and others, 1983). This report states that most interest in the area by major companies had waned by the 1920.

The strata with which the mine is associated include (from lower to upper) the Piegan argillite and quartzite, Purcell Lava, and the Shepard and Kintla units of the Missoula Group (argillites, sandstone, and quartzites). The deposit has been hypothesized to be a replacement type with indefinite vein boundaries (Whipple and others, 1983). That report estimated the resources at the Independence as 18,000 tons of 2.9% copper and 1,300,000 tons of 0.5% copper.

The workings explore quartz veins: both quartz-malachite-pyrite and calcite-chalcopyrite-pyrite and iron oxide (Johns, 1970). The veins strike northwest and dip 65° to vertical. Johns (1970) states that the lower adit explored a 17½-foot vein. Johns (1970) did not report any production from the property. Workings originally included six adits and other pits and trenches.

### 2.15.3 Environmental Condition

One discharging adit was located, but the discharge soaked into the ground before it reached an active drainage. No waste was in contact with an active drainage. The site was approximately 1,200 vertical feet above the Indian Creek drainage. Lemonade Springs is approximately ¼-mile to the southeast of the Independence. The site, while one of the larger mines in the area, is remote and isolated from many human visitors.

### 2.15.3. Site Features-Sample Locations

The adit discharge (IINS10M) was sampled on 09/30/98 in a small pool immediately south of the adit. Lemonade Springs (ILSS10M) also was sampled as an example of background water conditions. The waste dump had been previously sampled at the request of the Kootenai National Forest personnel and was tested for leachability of metals. The acid rain leach test was run on this sample from the "longest adit" found approximately on azimuth 165 degrees from the old cabin. It is believed that this is Johns' (1970) lower "No. 3" adit. Site features and sample locations are shown in figure 15; photographs are shown in figures 15a and 15b.

### 2.15.3.2 Soil

The only waste sample was taken for an acid-rain leach test. It was taken from the lower waste dump on December 13, 1994, at the request of the USFS.

Table 25. Acid rain leach results at the Independence mine (µg/L).

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ILWD0H-waste dump | SAC | | | | | AC | SA | | | | | | | | | | | | |

Exceedence codes:

S - Secondary MCL
A - Aquatic Life Acute
C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

2.15.3.3 Water

During this study, no upstream or downstream sample was taken because of the distance to Indian Creek. The adit was discharging one gpm; the water soaked into the waste dump and did not re-emerge at the toe. There was an exceedence in the adit discharge of the chronic aquatic life criteria in copper but only slightly (16 µg/L versus 12 µg/L). The pH of the adit discharge in 1998 was 7.97 and the specific conductance was 185 µmhos/cm. The Lemonade Springs sample had a pH of 8.32 and a specific conductance of 109 µmhos/cm.

Lemonade Springs was tested as a background sample. The water gushed out of the ground at approximately 70 gpm in two separate locations. The water was clear and very cold.

Table 26. Independence mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IINS10M-adit discharge | | | | | | C | | | | | | | | | | | | | |
| ILSS10M-spring | | | | | | | | | | | | | | | | | | | |

Exceedence codes:

C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

2.15.3.4 Vegetation

No signs of stressed vegetation were observed. The dumps were not well vegetated because of the limited soil cover and lack of moisture.

2.15.3.5 Summary of Environmental Conditions

While there was one exceedence (copper), the effects of the metals were restricted to the immediate vicinity. The site is remote and the discharge never reaches the active drainage.

2.15.4 Structures

The remnants from one cabin remain on the middle adit's dump. No other structures were located.

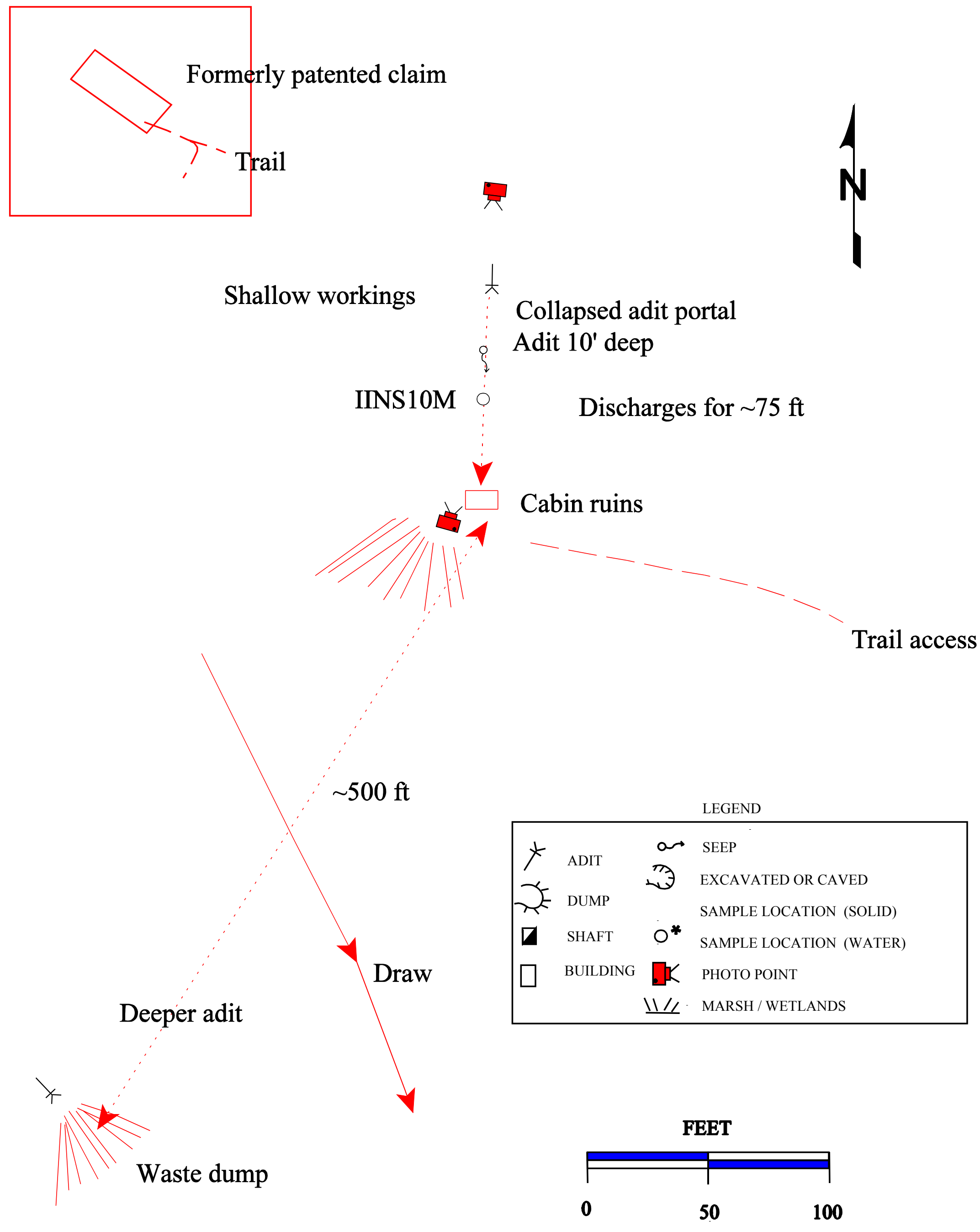


**Figure 15. The Independence mine, as sketched by USFS personnel, shows the location of the adit discharge.**

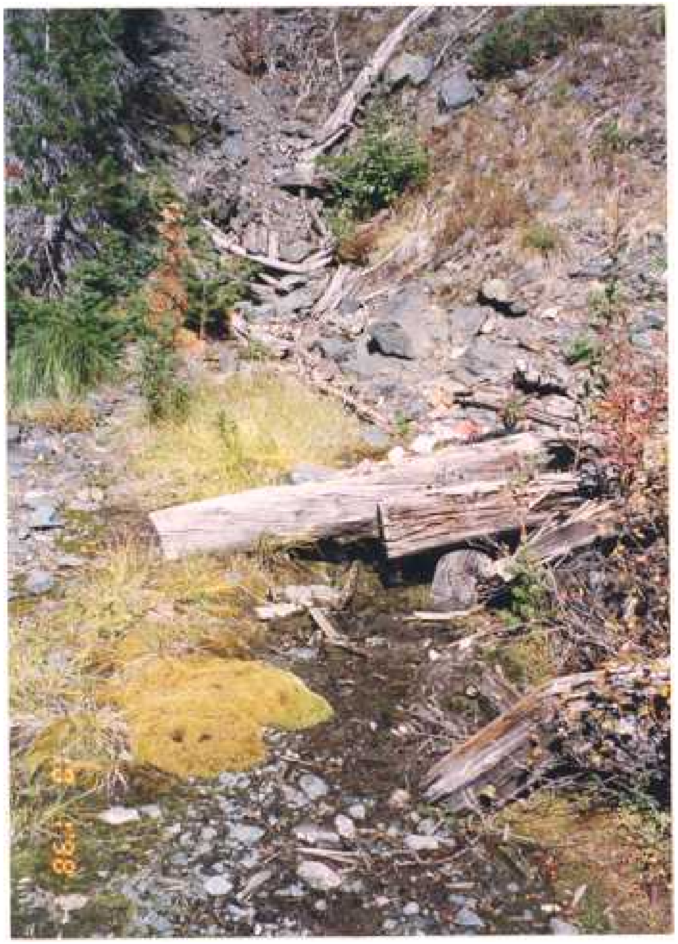

Figure 15a. Looking north at the adit discharge at the Independence, the discharge seeps from the adit and infiltrates into the waste dump. It does not re-emerge at the surface.

Figure 15b. Looking down from the talus and upper caved adit at the Independence, the adit can be distinguished by the green grass in front of the geologist.

2.15.5 Safety

The upper adit was open only 5 ft but it had overhanging rocks. The lower adit was still partially open; it was 6 ft by 6 ft by at least 20 ft deep with the tracks remaining. The middle, discharging adit was totally collapsed.

**The following mines are in the Fisher River drainage.**

## 2.16 Snowfall Prospect and King Mine

2.16.1 Site Location and Access

The Snowfall prospect and the King mine are located in the Silver Butte district on the Silver Butte Pass road (Forest Road 148). The Snowfall prospect can be located by parking immediately to the north of Silver Butte Pass at the trailhead for Trail 360 leading to the east. Access is via hiking the trail to the east and then turning north down an old overgrown mining road to the adit which is marked by a prospect symbol on the Silver Butte Pass 7.5-min. quadrangle. It is located in CBAC section 16, T25N, R30W. It is entirely on KNF-administered land.

The King mine is located down the road on the Goat Peak 7.5-min. quadrangle in DDAA section 7, T25N, R30W at an elevation of 4,920 ft. It is entirely on patented land and access is poor because of a locked gate and alders that have overgrown the road. Forest Road 2300 that leads to the mine is in good condition, however.

2.16.2 Site History-Geologic Features

The King mine was formerly known as the Silver Butte (Johns, 1970) and was discovered in 1887. The property was worked from 1905 to 1910 and after 1943. Companies that operated the mine included the Kentucky Vermilion Company and the Silver Butte Zinc-Lead Mining Company. Workings included four adits for a total of 4,300 feet. Reportedly, the quartz vein associated with the mine is 10–30 feet wide in Prichard argillite. Ore minerals include mostly galena, with lesser pyrite, chalcopyrite and sphalerite. Johns (1970) also described a mill that was built at the King mine.

The Snowfall mine was tentatively identified as such. The description in Johns (1970) places the Snowfall “a quarter of a mile north of Silver Butte Pass and 1½ miles southeast of the King mine.”

This description also states that the workings consisted of two adits, one of which was east of the road. West of the road, an adit and a discovery pit explored an eight-in. vertical vein. These workings were not found. The site was one unpatented claim that was relocated by Roark and Echo in 1955 (Johns, 1970). The geology of the area involved the Prichard-Ravalli contact with the ore found in a quartz-siderite and chalcopyrite-pyrite vein.

### 2.16.3 Environmental Condition

The King mine was not examined because the workings are all on patented land. Lacklen (oral communication, 1997) reported that the site had tailings and waste in contact with the creek. The Snowfall prospect was less than one acre of disturbance that had been practically totally obliterated by natural processes. Few artifacts of mining remained, only some iron remnants of a mill or processing facility were found in the intermittent drainage south of the adit. A depression representing the adit and a waste dump were barely discernible.

#### 2.16.3.1 Site Features-Sample Locations

The Snowfall prospect was sampled upstream and downstream, and a sample was taken at a point where the adit discharge pooled enough to sample. The site was visited twice. It was originally visited on October 29, 1997, but inclement weather prevented mapping the area so it was visited again on August 18, 1998. The King mine was sampled at this later date.

A downstream sample was taken below the King mine on South Fork of Silver Butte Creek. It was taken to evaluate the effects of the upstream mining activity. No upstream sample was taken because there was no access through the patented claims. Site features and sample locations at the Snowfall are shown in figure 16; a photograph is shown in figure 16a. A photograph of the downstream sampling site is shown in figure 16b.

#### 2.16.3.2 Soil

No soil samples were taken.

#### 2.16.3.3 Water

The pH of the downstream sample measured in the field exceeded the lower limit; it was 6.06. The lab pH measured 7.53. There were no other exceedences at the Snowfall.

The water in the South Fork of Silver Butte Creek appeared clear, cold and cascading. It carried no exceedences. The creek flowed at 20 gpm as measured with a bucket and stopwatch.

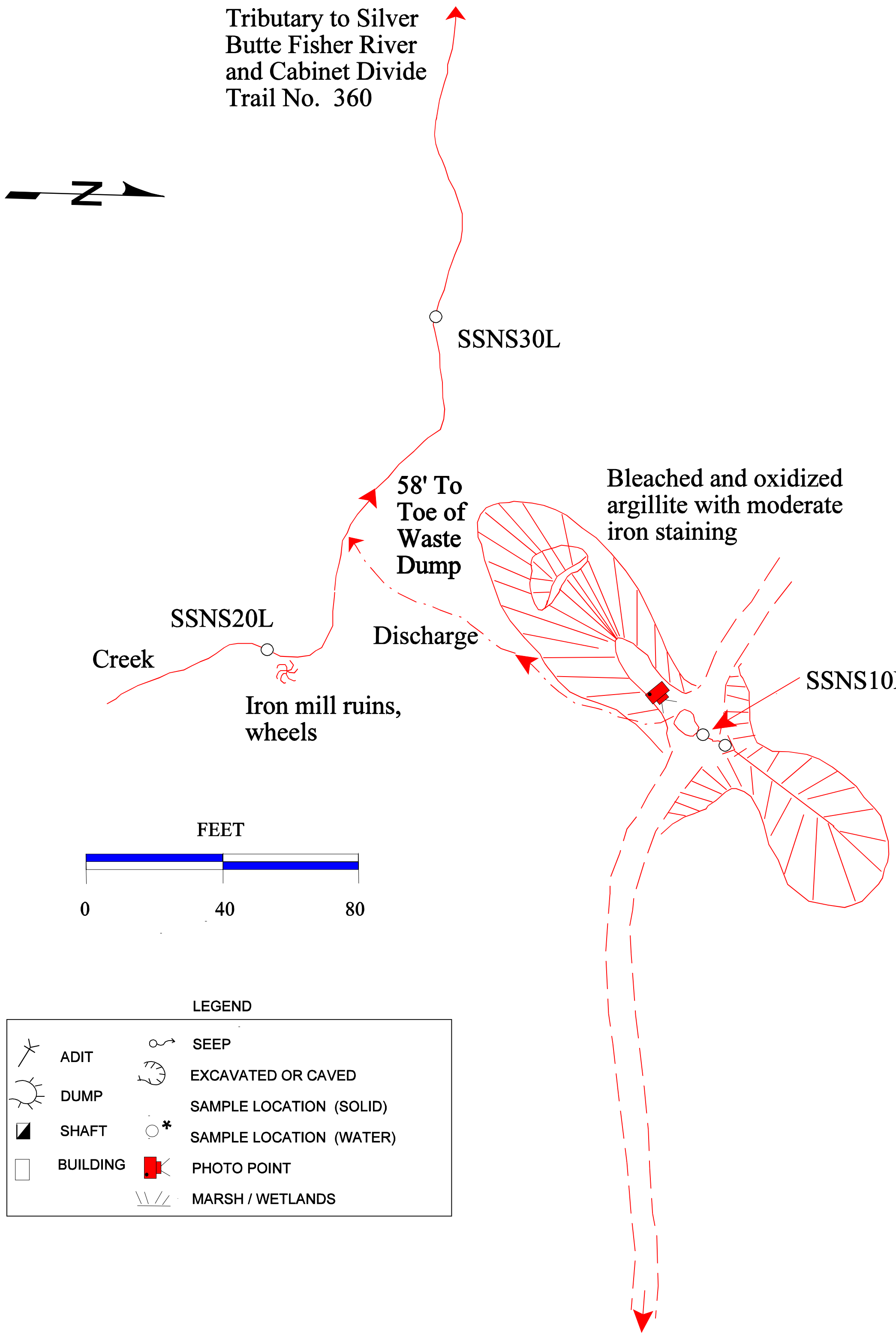


Figure 16. The small Snowfall prospect discharged water to an unnmed tributary to Silver Butte Fisher River, as mapped 8/18/98.

Figure 16a. The adit discharge at the Snowfall prospect pooled at the collapsed portal of the adit and formed a wet mossy area.

Figure 16b. A site on the South Fork of Silver Butte Creek was chosen to test the effects of mining upstream at the King mine.

Table 27. Snowfall and King mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSNS20L-upstream of site | | | | | | | | | | | | | | | | | | | |
| SSNS10L-adit discharge | | | | | | | | | | | | | | | | | | | |
| SSNS30L-downstream of Snowfall prospect | | | | | | | | | | | | | | | | | | | S[1] |
| SKIS10L-downstream of King mine | | | | | | | | | | | | | | | | | | | |

Exceedence codes:
S - Secondary MCL
(1) Laboratory pH did not exceed standard
Note: The analytical results are listed in appendix IV.

#### 2.16.3.4 Vegetation

No effects to the vegetation were noted. The Snowfall mine had lush vegetation, and the trees on the waste dump appeared healthy.

The road into the King mine was overgrown with alders. Unvegetated waste dumps could be seen in the distance. Those workings were on private land and so were not evaluated.

#### 2.16.3.5 Summary of Environmental Conditions

The effects of the mining at the Snowfall were localized, as were the effects at the King mine.

### 2.16.4 Structures

No evidence of any structures were found at the Snowfall. A iron flywheel was partially submerged in the boggy bank next to the creek.

The King mine had buildings that could be seen in the distance. All buildings were on private land.

2.16.5 Safety

The Snowfall prospect had a totally collapsed adit with a steep highwall. The site was remote, and so safety concerns were negligible. The King mine was on private land and was not evaluated for safety.

## 2.17 Viking Mine or Gold Hill Claims

### 2.17.1 Site Location and Access

The Viking mine lies to the north-northeast of the Snowfall and King sites. The mine is accessed via Forest Route 148 traveling 9.7 miles from the turnoff on Highway 2. The small side road crosses the Silver Butte/Fisher River and access is then by hiking a short distance. It lies on the Silver Butte Pass 7.5-min. quadrangle and is entirely on KNF-administered land.

### 2.17.2 Site History-Geologic Features

Three patented claims in the Gold Hill group and other unpatented claims comprise the Viking mine. The foundation of a mill is still present. It was built in 1938 but abandoned in 1946, and was already collapsed in 1961 (Johns, 1970). Ravalli quartzite and quartzitic argillite host the deposit that consists of galena, chalcopyrite, pyrite, limonite, and hematite (Johns, 1970). The ore minerals are found in bedding veins of quartz and free gold. Contacts with Prichard argillite and a metadiorite sill may also be associated with the mine.

Workings consisted of five tunnels with almost 2,000 feet of drifts and crosscuts. Nearly all the development is on patented claims. One adit was partially open, and one stope had daylighted. The remainder of the adits are completely caved; the lowest has a small discharge.

### 2.17.3 Environmental Condition

The discharge seeps from a collapsed adit, runs down the road, and then drops over the slope above the foundation of the old mill. It does not enter the active drainage. No adverse effects were noted to the environment.

#### 2.17.3.1 Site Features-Sample Locations

The adit discharge (SVIS10L) was sampled and samples were taken upstream (SVIS20L) and downstream (SVIS30L) on an unnamed tributary to Silver Butte Creek that flows from south to north in section 4. The adit discharge was sampled in a small pool formed immediately in front of the collapsed adit. The upstream and downstream samples were taken approximately 100 feet from the site. The site was sampled on 10/28/97. Site features and sample locations are shown in figure 17; a panorama photograph is shown in figure 17a.

2.17.3.2 Soil

No soil samples were taken. The waste dumps were not in contact with any active water body and no effects to the soil were noted.

2.17.3.3 Water

No water-quality limits were exceeded at the Viking. The adit discharge showed only a slight increase in zinc from below detection limit upstream and downstream of the mine to 2.9µg/L in the adit discharge. This level is well below the water-quality standards which are in the 100's of µg/L (the secondary MCL is 500 µg/L.)

Table 28. Viking mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVIS20L-upstream of site | | | | | | | | | | | | | | | | | | | |
| SVIS30L-downstream of mine | | | | | | | | | | | | | | | | | | | |
| SVIS10L-adit discharge | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

2.17.3.4 Vegetation

No effects of the mining on vegetation was noted. The site was investigated in late Fall when much of the vegetation had become dormant but no dead or dying trees were noted. The grasses all appeared healthy.

2.17.3.5 Summary of Environmental Conditions

Mining at the Viking affected very little of the environment. Most of the effects were physical in nature. Two adits were partially open, and a stope had daylighted.

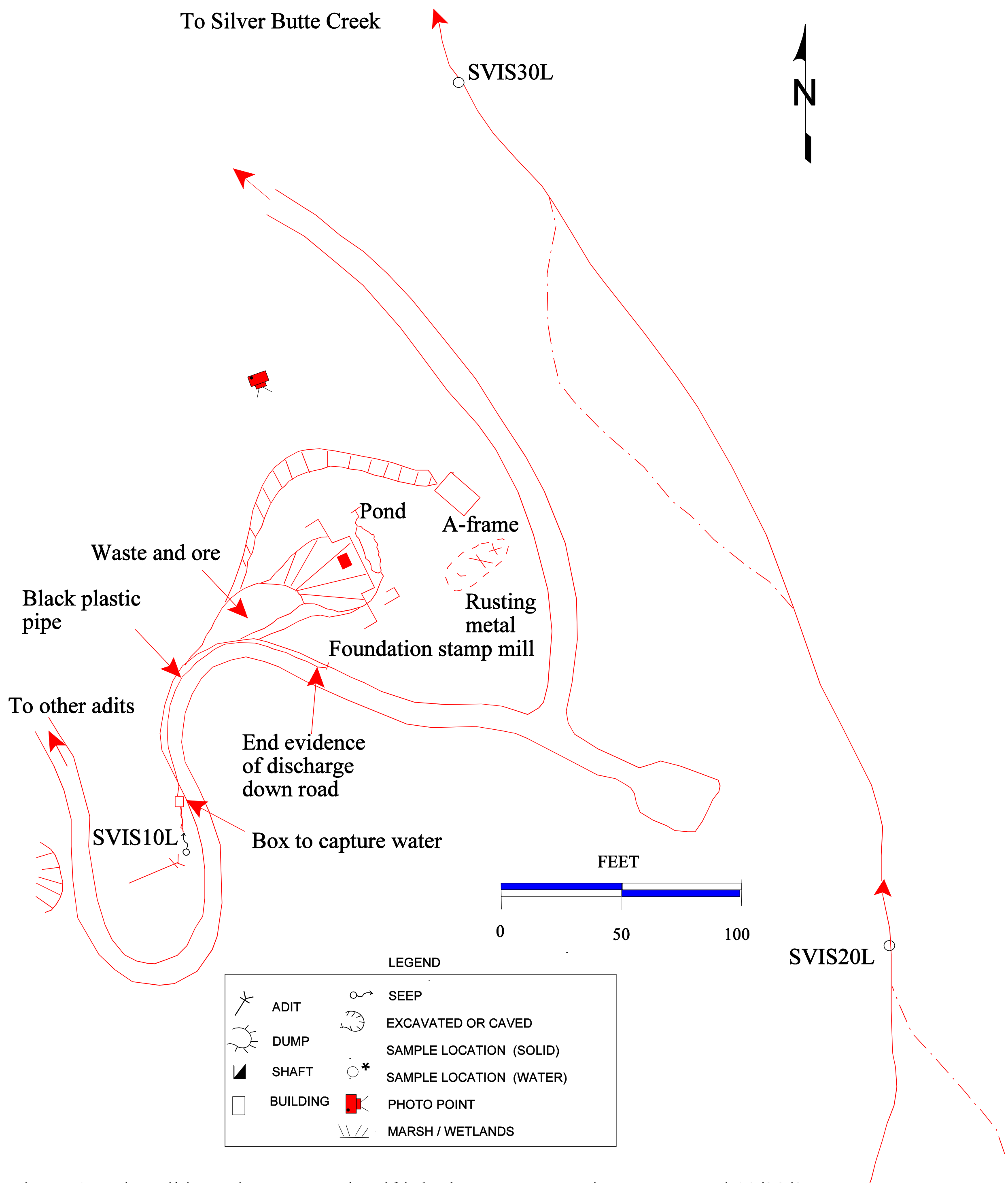


Figure 17. The Viking mine appeared as if it had recent occupation, as mapped 10/28/97.
It had one adit with a small discharge.

Figure 17a. Recent habitation at the Viking has resulted in a modern A-frame and the older mill foundation (right) has the remains of an old stamp mill. The USFS was planning to clean up the site.

2.17.4 Structures

An A-frame cabin was still present when this investigation looked at the property. The concrete foundation was all that was left of the mill except for an iron hopper for the stamp mill. Boards and parts of old mining equipment had been stacked to the south of the cabin. Tables, bench seats out of vehicles, and miscellaneous equipment was strewn around the site.

2.17.5 Safety

The site had partially open adits and at least one stope that had daylighted. The lower adit that trended S58EW was open with a hole large enough for an animal to enter. The iron base of the mill was tilted and may tip in the future.

## 2.18 Bramlet Creek (and Branagan) Mine

2.18.1 Site Location and Access

This unnamed site is located on Bramlet Creek immediately downstream from the Branagan mine. Forest Route 2332 leads to the Branagan and Bramlet Creek site. The site lies approximately two miles from the junction of the Fisher River The road is closed approximately ⅛-mile beyond the millsite at the trailhead of Trail 658. The road as far as the mill is improved gravel with the mill itself located on a small overgrown 200 foot long spur road. The Branagan mine is accessible only by hiking a steep hillside after crossing Bramlet Creek. The workings (some open) at the Branagan are on patented land.

2.18.2 Site History-Geologic Features

The Branagan mine was reported to have had a mill; a mill foundation was found at the Branagan. Gibson (1948) described a 10-stamp mill that ran for several years at the Branagan. Johns (1970) reported that a 15-stamp mill was built to process ore from the Branagan approximately around the turn of the century. No mention of a second mill was found in literature. The mine dumps were eroded by Bramlet Creek during high water (Johns, 1970). This report also mentions that mill tailings were present in the creek and were claimed as a placer.

2.18.3 Environmental Condition

The Bramlet Creek site poses few environmental problems. The floods and years of erosion have washed most of the tailings and waste dumps associated with the two sites downstream. The samples were collected to assess any problems that were not visibly evident.

2.18.3.1 Site Features-Sample Locations

Water-quality samples were collected upgradient (BBRS10L) and downgradient (BBRS20L) of the site on KNF-administered land. The flow rates at these locations were 75 gpm and 400 gpm, respectively. Upstream, Bramlet Creek pH was 5.94, and specific conductance was 10 µmhos/cm. The upstream sample was taken immediately upstream from where the patented land started and where the creek split into several channels. Downstream, Bramlet Creek pH was 7.25 and specific conductance was 20 µmhos/cm. The second sample was taken approximately 50 feet downstream from the mill ruins. Samples were collected on July 31, 1998. Site features and sample locations are shown in figure 18; photographs are shown in figures 18a and 18b.

2.18.3.2 Soil

Soil samples were not collected.

2.18.3.3 Water

The concentration of analytes in the upstream sample (BBRS10L) did not exceed any water-quality standards (table 2). The pH did fall below acceptable levels (5.94), and this reading was replicated in the lab (5.95). The concentration of analytes in the downstream sample actually decreased from or stayed the same as the upstream sample. The pH increased in the downstream sample to an acceptable level of 7.25.

Table 29. Bramlet Creek mill water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BBRS10L-upstream of site | | | | | | | | | | | | | | | | | | | S |
| BBRS20L-downstream of site | | | | | | | | | | | | | | | | | | | |

Exceedence codes:

S - Secondary MCL

Note: The analytical results are listed in appendix IV.

2.18.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Trees and shrubs grew up to the waters edge. Small trees grew up through the timbers of the collapsed mill building.

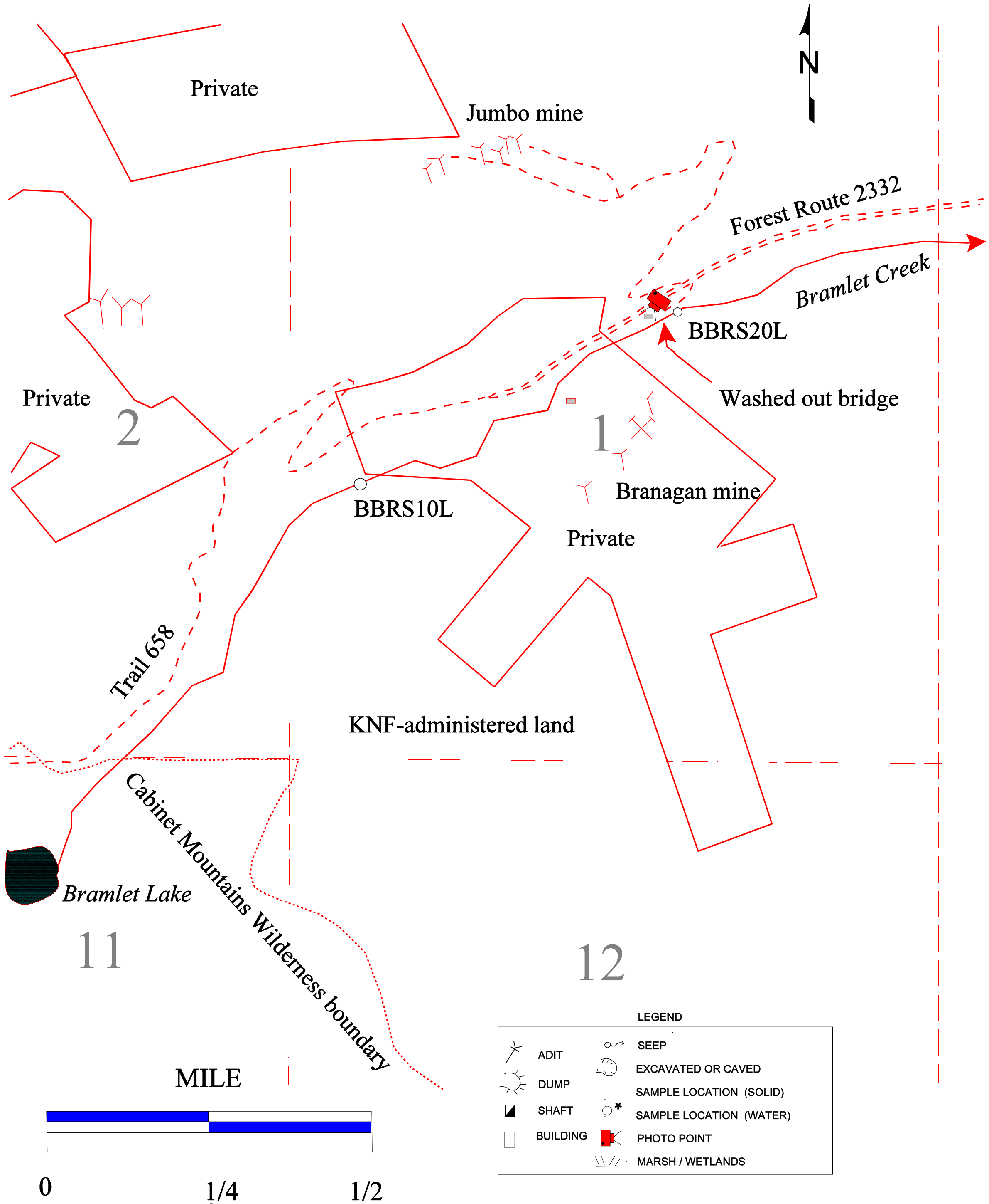


Figure 18. The Branagan mine was located entirely on patented land. The Bramlet Creek mill was entirely on KNF-administered land, as inventoried July 31, 1998.

Figure 18a. Collapsed mill ruins lay beside Bramlet Creek; no trace of its tailings could be found.

Figure 18b. Bramlet Creek ran clear and cold downstream from the Bramlet Creek mill.

2.18.3.5 Summary of Environmental Conditions

The site was not greatly impacted by the mining activity. No metals loading was noted. Few physical remnants of the milling remain.

2.18.4 Structures

All structures at the Branagan are on private property and were not evaluated or inventoried. The mill adjacent to Bramlet Creek is almost totally collapsed. It should be considered a slight hazard because a few timbers on the uphill side are still standing.

2.18.5 Safety

The site has few hazardous structures but on the other hand is readily accessible. Evidence of a recent campsite at the end of the small spur road that leads to the mill suggests recreational use.

## 2.19 Gloria or Little Annie Mine

2.19.1 Site Location and Access

The Gloria, as it is now known, lies high on the south-facing slope of West Fisher Creek. A four-wheel drive road turns north from just before where Forest Route 6746 is gated in section 34. The access is actually by four-wheel drive from where the road crosses West Fisher Creek in the SE¼ section 36. The road here has been washed out by the creek. The mine is located on the Howard Lake 7.5-min. quadrangle at an elevation of 5,620 feet in section 27, T27N, R31W.

2.19.2 Site History-Geologic Features

The Golden West Mining Company first mined here as the Little Annie (Gibson, 1948) as early as the 1930's. The base camp was along West Fisher Creek and a cabin was built at the mine. In the 1950's, one claim was relocated (Johns, 1970). The adits explored a quartz vein that is parallel or subparallel to bedding in Prichard argillite and sandstone. It is up to two feet thick and contains native gold, as well as sphalerite, pyrite, galena, and lesser pyrrhotite and chalcopyrite (Gibson, 1948).

2.19.3 Environmental Condition

No adverse effects were noted at the Gloria except for surface disturbances. The area was near timber line, and the vegetation was typical for the elevation. Trees were slightly stunted from the naturally harsh environment.

2.19.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream (FGLS30L) and downstream (FGLS20L) of the site on KNF-administered land on an unnamed tributary to West Fisher Creek. It appeared as if it was a permanent stream, although the flow was small and sometimes went subsurface under talus. The flow rate at both locations was 15 gpm. Upstream, pH was 6.99 and specific conductance was 12 µmhos/cm. Approximately 100 feet downstream from the mine workings (FGLS20L), pH was 6.98, and specific conductance was 10 µmhos/cm. A sample of the adit discharge (FGLS10L) exceeded secondary MCL and chronic water-quality standards for aluminum and manganese. The pH was also low; it measured 6.01 in the field and 6.13 in the lab. It, therefore, was below the 6.5 cutoff for pH. The flow of the adit discharge was small at one gpm. Samples were collected on October 15, 1997 (although the camera dated the photo as October 16). Site features and sample locations are shown in figure 19; photographs are shown in figures 19a and 19b.

2.19.3.2 Soil

Soil samples were not collected.

2.19.3.3 Water

The concentrations of analytes in the upstream and downstream samples did not exceed any water-quality standards (table 2). The concentration of aluminum in the adit-discharge sample exceeded the secondary MCL and the chronic aquatic life standard. The pH was also below the secondary MCL standard for water quality; manganese levels exceeded the secondary MCL.

Table 30. Gloria mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FGLS30L-upstream of the Gloria | | | | | | | | | | | | | | | | | | | S |
| FLGS20L-downstream of the Gloria | | | | | | | | | | | | | | | | | | | |
| FGLS10L-adit discharge | SC | | | | | | | | S | | | | | | | | | | |

Exceedence codes:

S - Secondary MCL

C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

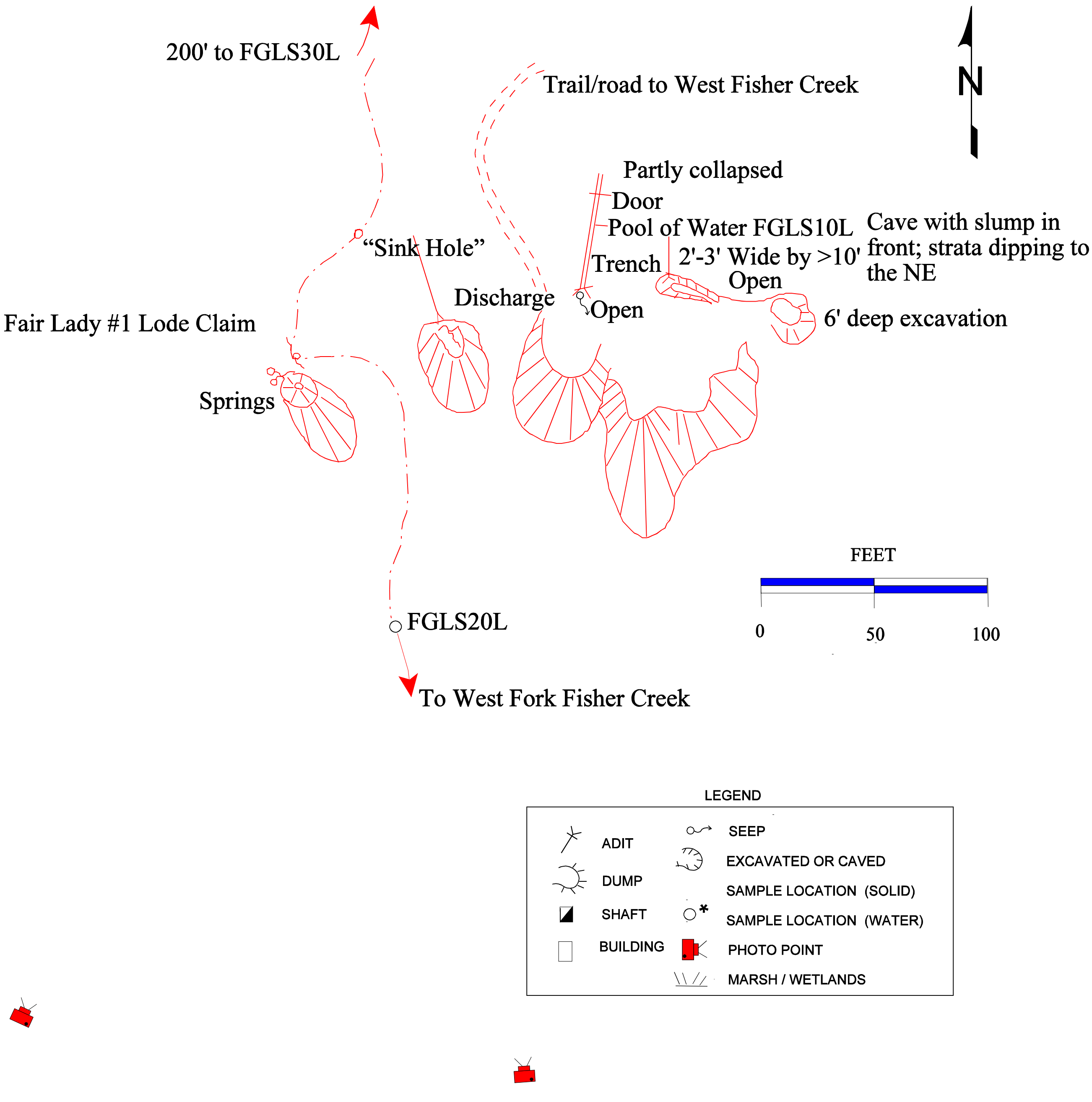


Figure 19. One open adit at the Gloria discharged water that formed a pool of water near the portal, as inventoried, October 16, 1997.

Figure 19a. As viewed from the road to the Wayup mine, the Gloria's waste dumps and cabin were visible on the south-facing slope north of West Fisher Creek.

Figure 19b. One waste dump at the Gloria was in contact with the unnamed tributary to West Fisher Creek.

2.19.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. The mine is located on a south-facing slope at an elevation at which the trees are thinning out because of the elevation. Larch and fir trees are beginning to grow after being logged recently. No dead or dying trees were noted. The vegetation is stressed in the general area due to the elevation and harsh climate.

2.19.3.5 Summary of Environmental Conditions

Although the adit discharges had exceedences in two metals (aluminum and manganese), the flow was extremely small (one gpm). The low pH would be a problem except for the fact of the small flow. The analyses of the upstream and downstream samples were similar.

2.19.4 Structures

One cabin remained at the mine site. It was well built but the windows were missing. Another cabin was adjacent to West Fisher Creek at the main camp. Both were in good condition.

2.19.5 Safety

One open adit was found at the Gloria. A second adit was largely caved but the opening was large enough to crawl into. The site is remote and not easily reached, but it is marked on the topographic map. There were no signs of recreational activity at the time of this visit.

## 2.20 Vermiculite Mountain Mine

2.20.1 Site Location and Access

The Vermiculite Mountain mine is on private land near the head of Rainy Creek basin (section 22, T31N, R30W). The site is accessible by taking highway 37 for 5.5 miles out of Libby, then turning north on Rainy Creek road for approximately one mile where the mine property begins.

2.20.2 Site History-Geologic Features

In 1915, E. N. Alley of Libby was prospecting for vanadium when he noticed that the coarse mica-like minerals in the walls of his mine swelled enormously when heated by the flame of his candle. This mineral proved to be vermiculite. Mr. Alley and others formed the Zonolite Co. and started a small-scale production of the vermiculite in 1925. By 1948, a 1,000-ton mill was erected at the site, producing 350 to 400 tons of concentrate per day, and in 1959 the mill was enlarged. By this time the site was known as the largest vermiculite mine in the United States (Johns,1959).

Johns (1959) describes the deposit as an elongated stock composed of pyroxenite and syenite. Intruding the Wallace and Striped Peak formations, the pyroxenite is coarse grained and composed of vermiculite, aegerine-augite, fibrous amphibole asbestos, magnetite, and biotite. According to Johns, the vermiculite has been derived from hydrothermally altered biotite.

#### 2.20.3 Environmental Condition

The site has been extensively mined over the years from underground and open-pit strip mining, but has since been re-contoured and re-seeded over most of the disturbed area. The site is on private land so a site map was not prepared, nor were any detailed observations made of any structures on the site.

#### 2.20.3.1 Site Features-Sample Locations

An upstream and downstream water sample was collected on Rainy Creek on KNF-administered land above and below the Vermiculite Mountain mine to assess whether the mine has any impact on Rainy Creek. Site features and sample locations are shown in figure 20.

#### 2.20.3.2 Soil

Soil on KNF-administered land did not appear to have been affected by runoff or sedimentation from the Vermiculite Mountain mine. No soil samples were collected.

#### 2.20.3.3 Water

The upstream surface-water sample (RVMS10H) was collected at the head waters of Rainy Creek, which at that time was flowing approximately 100 gpm on KNF-administered land above the Vermiculite Mountain mine property. The downstream water sample (RVMS20H) was collected as it flowed onto KNF-administered land below the Vermiculite Mountain mine, which had increased to an estimated 300 gpm. Neither of the surface water samples exceeded MCLs for any of the constituents tested.

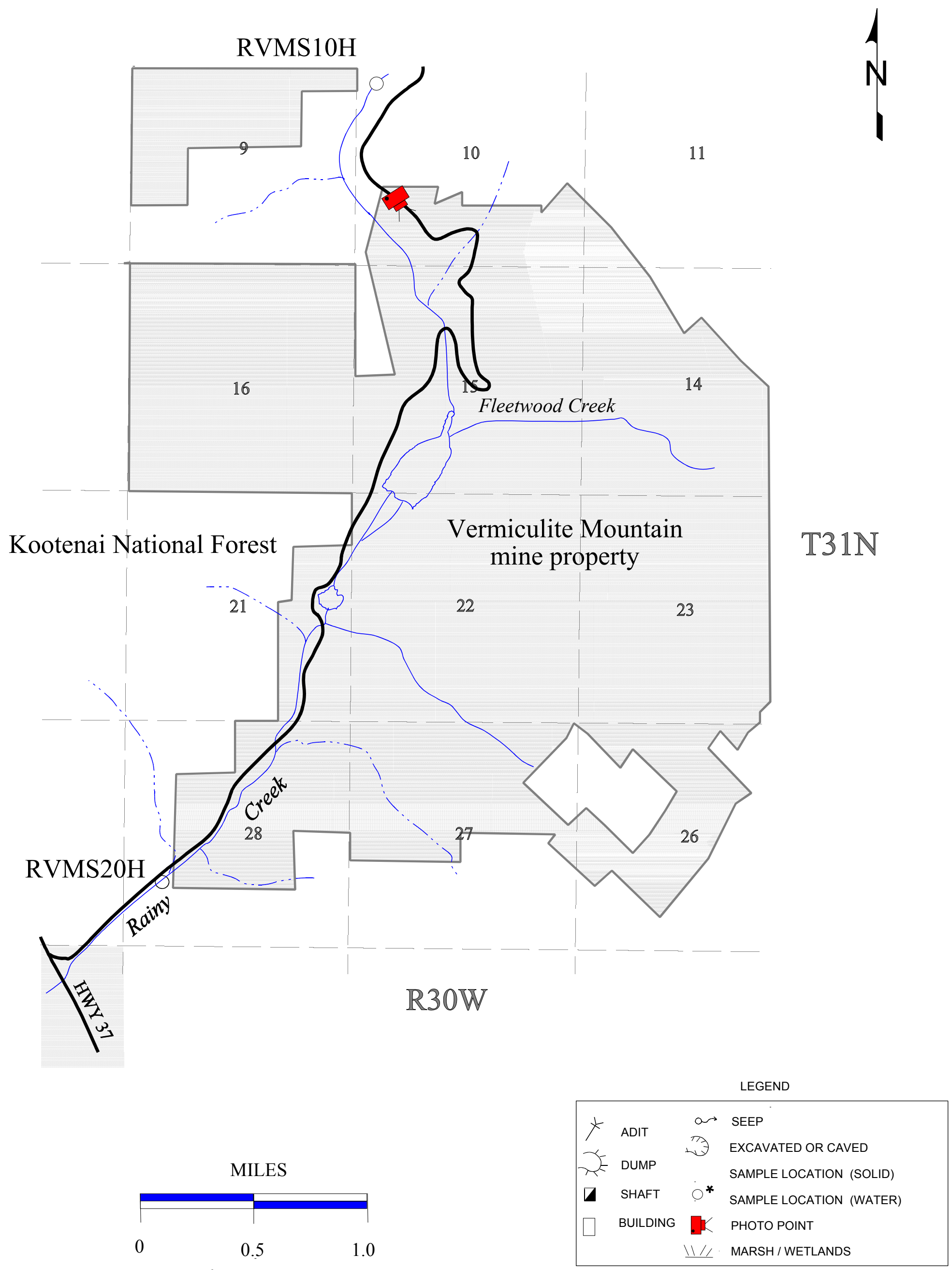


Figure 20. The Vermiculite Mountain mine.

2.20.3.4 Vegetation

Vegetation appeared healthy throughout the site with much of the site being re-vegetated along Rainy Creek.

2.20.3.5 Summary of Environmental Condition

Environmental impact from the site appears limited; much of the mine site has been re-contoured and re-vegetated.

2.20.4 Structures

All of the structures, waste dumps, and debris are on private land. No building material associated with the mine was observed on KNF-administered land.

2.20.5 Safety

Rainy Creek road allows public access through private land, but all secondary roads are gated or chained shut, and the mine property is well posted as private with no trespassing.

## 2.21 Copper Reward Mine

2.21.1 Site Location and Access

The Copper Reward is accessible only by hiking the closed road (Forest Road 4785) leading up Cherry Creek. The road has been closed off by a Kelly hump approximately two miles down from the adit in the SE¼ section 4. The adit lies up the hill on a faintly evident overgrown mining road leading to the north/northwest in CDAD section 08, T28N, R31W. The overgrown road switchbacks at the avalanche chute and then goes east another 300 feet. The mine is at approximately 3,840 feet elevation and is on the Cable Mountain 7.5-min. quadrangle map.

2.21.2 Site History-Geologic Features

The Copper Reward is also known as the Walker Tunnel. The tunnel was the main working on a "group of five claims on the north side of Cherry Creek" (Gibson, 1948). The five claims were the Copper Reward, Hidden Treasure, Copper Gold, Contention, and Nellie L. (Johns, 1970). The configuration of the claims as well as the location of the Walker Tunnel were shown on figure 15 in Johns (1970). The mine (actually on the Copper Gold unpatented claim according to

Johns) explored at least 440 ft back along a shear zone. The actual Copper Reward unpatented claim lies on the south side of Cherry Creek (Johns, 1970). Figure 16 in the Johns (1970) report showed the configuration of the mines associated with the Snowshoe fault, with the Copper Reward on a NW-SE-trending splay of the fault.

The adit was caving as long ago as pre-1948 and was caved in 1970 when Johns visited it. Two other totally collapsed adits were found just north of the closed road (Forest Road 4785) along Cherry Creek.

Ravalli quartzite (N25°W, 35°NE) hosts the near vertical shear zone that strikes approximately the same direction. Ore minerals included pyrite, arsenopyrite, galena with lesser chalcopyrite and sphalerite (Gibson, 1948). Oxides included anglesite, malachite, azurite, and limonite (Johns, 1970). No production was noted.

## 2.21.3 Environmental Condition

The disturbance at the adit was less than one acre. The adit discharge flowed from the collapsed portal and pooled on the flat area to the south of the adit. It then infiltrated into the waste dump and did not re-emerge from the dump. The dump lies approximately 500 feet uphill (and 230 feet in elevation) from Cherry Creek.

### 2.21.3.1 Site Features-Sample Locations

One water-quality sample was collected from the adit discharge (CWTS10L) at the site on KNF-administered land. The flow rate at this location was 15 gpm. The pH was 6.82 and specific conductance was 91 µmhos/cm. The sample was collected on September 02, 1998. Site features and sample locations are shown in figure 21; photographs are shown in figures 21a and 21b.

### 2.21.3.2 Soil

No soil or waste samples were collected at the Walker Tunnel. The waste dump was approximately 500 feet from the active drainage.

### 2.21.3.3 Water

The concentration of analytes in the adit discharge (CWTS10L) did not exceed any water-quality standards (table 2). The water appeared clear and cold. No metals precipitate was noted.

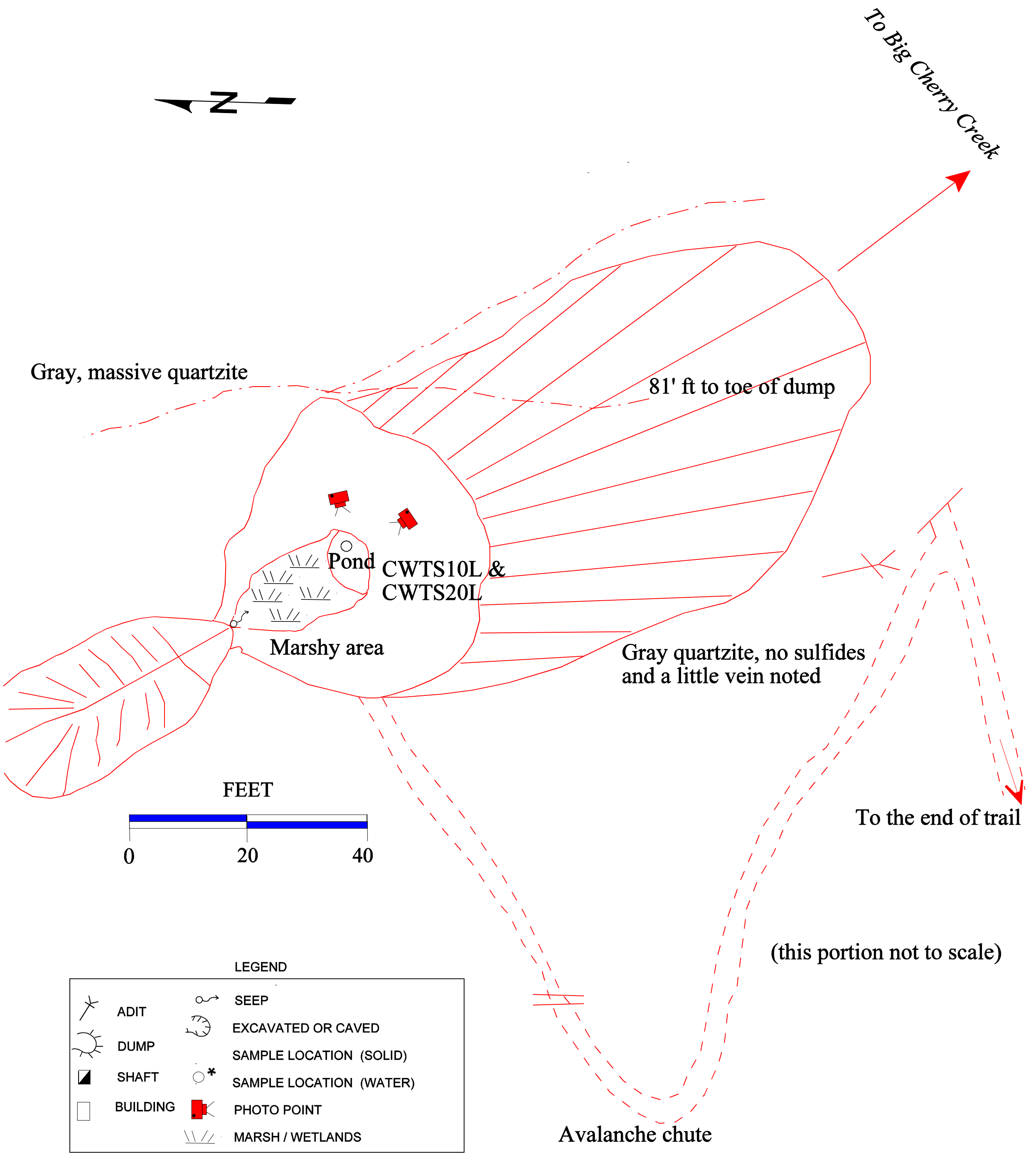


Figure 21. The Walker Tunnel at the Copper Reward discharged two gpm and the water pooled on the waste dump.

Figure 21a. A seep emerged from the collapsed adit portal at the Copper Reward, flowed approximately 20 feet where it formed a small pool on the waste dump. It then infiltrated the dump.

Figure 21b. At the Copper Reward, lush green vegetation grew up to edge of the pool formed by the adit discharge.

Table 31. Copper Reward (Walker Tunnel) mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (CWTS10L)-adit discharge | | | | | | | | | | | | | | | | | | | |
| (CWTS20L)-duplicate of adit discharge | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

#### 2.21.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. The grasses that grew on the flat area were tall and lush. None of the trees showed any sign of stress.

#### 2.21.3.5 Summary of Environmental Conditions

This site was sampled for the sake of completeness and not because there were indications of problems. The water quality analyses showed that the water had no exceedences of any water-quality criteria.

### 2.21.4 Structures

No structures remained at the site. There may have been a cabin on the road at the site, but only scattered boards and debris remained.

### 2.21.5 Safety

The site is remote, not easily visible, and small in extent; no hazards were noted.

## 2.22 Snowshoe Mine

### 2.22.1 Site Location and Access

The Snowshoe mine is located in BADA section 07, T28N, R31W and the Snowshoe Peak 7.5-min. quadrangle at an elevation of a little less than 4,600 feet. The adits are at higher elevations. The mine can be found at the terminus of a four-wheel drive road that follows Snowshoe Creek up the valley. The site lies less than 1.5 miles from the Cabinet Mountains Wilderness boundary.

### 2.22.2 Site History-Geologic Features

Associated with the Snowshoe fault, the Snowshoe mine was one of the largest metals producers in the area. The four patented claim names associated with this mine are the Chinook, Rustler, Snowshoe, and Porcupine (Johns, 1970). The claims were first explored in the1870's and were intermittently worked until recently. Recorded production from 1901 to 1945 was 54,194 tons although estimates using the mine maps and stopes equaled 250,000 tons of ore (MBMG mineral property files). At least five adits were driven and one shaft sunk, with a cumulative footage of 6,500 feet of drifting along the Snowshoe fault. The workings totaled over 8,000 ft. The same mineral property files described the ore as consisting of argentiferous galena in white quartz and quartzite. The mining method used combined open-stulled stope, and cut and fill.

The geology of the area is dominated by the Snowshoe fault, striking N12°W with a near-vertical dip and in places, producing a shear zone averaging six feet wide (Gibson, 1948). The fault places Ravalli sandstones and argillites to the east adjacent to the Wallace Formation's shales and limestones. Ore minerals include chiefly galena and sphalerite with lesser pyrite and sparse chalcopyrite and arsenopyrite. Gibson (1948) reported that a personal account by one of the owners estimated that up to 40% of the concentrates were lost by poor milling methods. An article from the Spokesman Review from April 25, 1943 (MBMG mineral property files) stated that the original mill (250-tpd capacity) made no attempt to recover the zinc in the ore, resulting in metal-rich tailings at the Snowshoe site.

### 2.22.3 Environmental Condition

A portion of the area was recently reclaimed by DSL-AMRB and the USFS (approximately 1989). The area downhill from the adits appeared to have been recontoured and reseeded. Rills and deeper gullies running to the creek had already started to form on the slope. Downstream from the flat area formed by the mill site, Snowshoe Creek was actively eroding the partly indurated waste that lined its banks. Large slabs of iron-cemented waste with abundant visible chunks of galena were being undermined by the creek. A covering of a fine-grained clay (lime?) capping also was being eroded.

#### 2.22.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream (SSNS10L) and downstream (SSNS20L) of the site on KNF-administered land. The flow rates at these locations were 440 and 507 gpm, respectively. Upstream, Snowshoe Creek pH was 8.1 and specific conductance was 62 µmhos/cm. Downstream, Snowshoe Creek pH was 7.57 and specific conductance was 81 µmhos/cm. Samples were collected on July 30, 1998. A spring that emanated from the north side of the tailings area was also sampled (SSNS30L). Its pH was 7.39 and specific conductance was

88; the flow was estimated to be 15 gpm. More samples were not collected because of the private land position. Additional samples of the springs and seeps on the flat (tailings?) area and from a monitor well on the lower end of the tailings area were taken by Pioneer Technical Services (1995). Site features and sample locations are shown in figure 22; photographs are shown in figures 22a, 22b, and 22c.

2.22.3.2 Soil

Two waste samples were collected. SSND10H was a composite sample along the waste being actively eroded by Snowshoe Creek. It had visible fragments of galena in a iron-cemented waste. The sample was collected along 100 feet of the creek. The second sample (SSND20H) was of the white to light gray clay capping material on the waste as it was being eroded by the creek This material has elevated levels of lead and zinc that exceed phytotoxic limits. Lacklen (USFS, 1998, pers. comm.) indicated that this material may be the cover spread as a part of the reclamation effort in the area.

Table 32. Soil sampling results (mg/kg) for the Snowshoe mine.

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Waste eroding into creek (SSND10H) | 5515.8[1,2] | 90.41[1] | 328.56[1,2] | 10872.1[1,2] | 9315.079[1,2] |
| Capping material (SSND10H) | 56.07[1] | 11.19[1] | 11.80[1] | 686.78[1,2] | 1045.09[1,2] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).
(2) Exceeds phytotoxic levels (table 3).

2.22.3.3 Water

The concentration of analytes in the upstream sample (SSNS10L) did not exceed any water quality standards (table 2). The concentration of cadmium in the downstream sample exceeded the primary MCL as well as the acute and chronic aquatic life criteria. The lead level also exceeded the acute and chronic criteria downstream. The spring (SSNS30L) exceeded the acute and chronic aquatic life criteria for zinc. This may be because of natural conditions or because of an unidentified source of the zinc. This spring may be the "intermittent tributary" sampled by Pioneer Technical Services (1995).

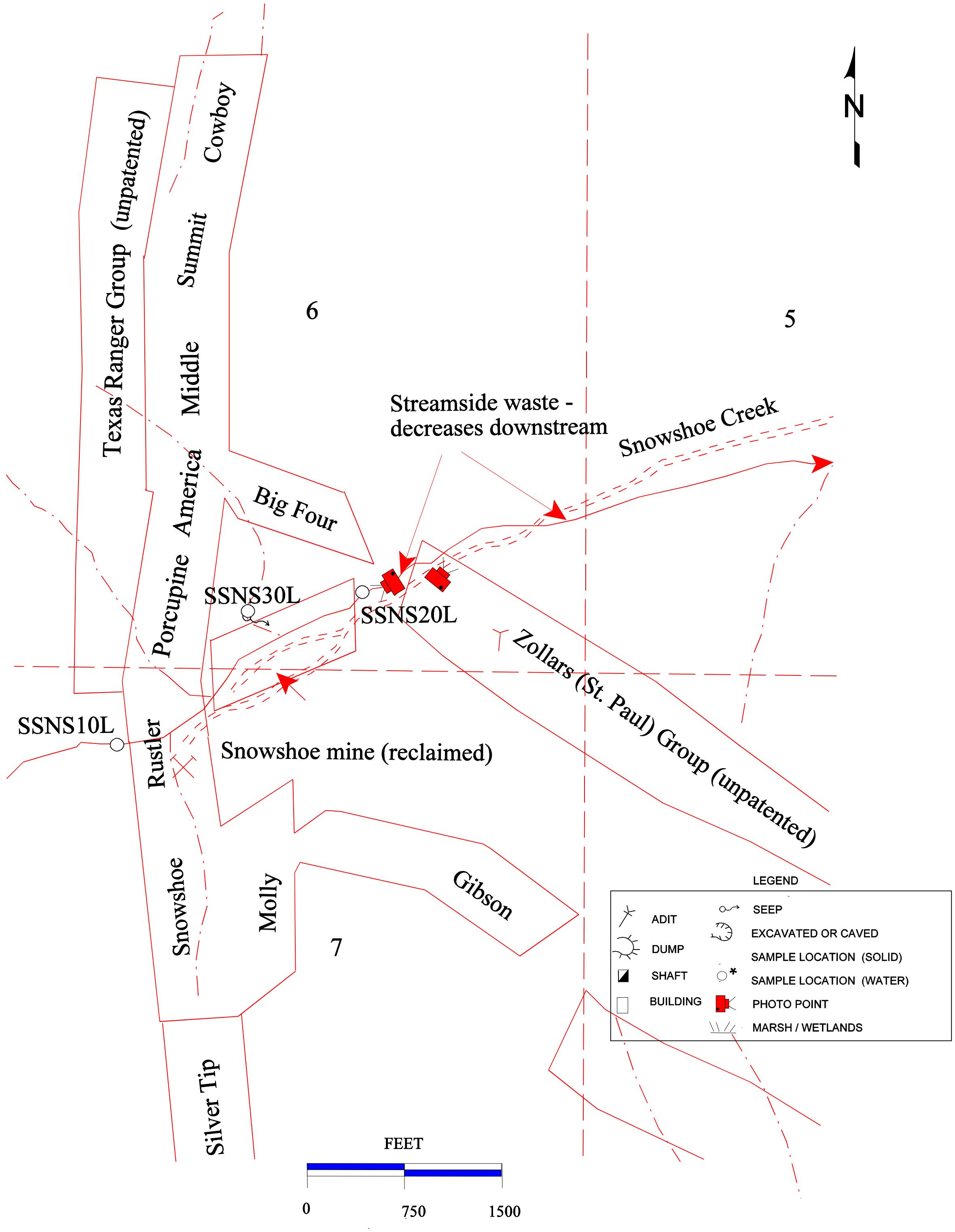


Figure 22. Sampling sites were dictated by the private ownership at the Snowshoe mine, as shown in this schematic from the Snowshoe Peak 7.5-min. quadrangle.

Figure 22a. A panorama looking west shows the flat reclaimed area. The adits at the Snowshoe were behind the trees to the left, and the mill was in the valley bottom. A monitoring well is in the right foreground. Snowshoe Creek flows from the notch in the center of the photo and then to toward the right foreground. There are numerous springs and seeps flowing in the area, possibly associated with the Snowshoe fault.

Figure 22b. At the Snowshoe, a seep emerged from the disturbed area on the north side of the flat area and mixed with the water from a natural spring. The iron staining that is evident distinguishes the two sources.

Figure 22c. Recently indurated mine waste downstream of the Snowshoe was actively being undercut by Snowshoe Creek. A white clay capping lies on the surface of the waste and tailings.

Table 33. Snowshoe mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSNS30L-spring | | | | | | | | | | | | | A C | | | | | | |
| SSNS10L-upstream | | | | | | | | | | | | | | | | | | | |
| SSNS20L-downstream | | | | P A C | | | | | | | | | A C | | | | | | |

Exceedence codes:

P - Primary MCL

A - Aquatic Life Acute

C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

#### 2.22.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. The vegetation on the flat area that is patented did appear to be barren with only mosses and sparse grass growing. The lack of vegetation may be due to the recent nature of the reclamation.

#### 2.22.3.5 Summary of Environmental Conditions

Most of the disturbances and problems at the Snowshoe are on the patented ground. The water leaving the private ground and running onto KNF-administered land did have exceedences in cadmium and zinc. The waste that is being actively eroded downstream also exceeded levels of arsenic, cadmium, copper, lead, and zinc. Even the capping material had levels of metals that exceeds the Clark Fork Superfund background levels and zinc in the capping material exceeds the phytotoxic level.

### 2.22.4 Structures

No structures remain at the Snowshoe mine. The Snowshoe Peak 7.5-min. topographic map shows some symbols of building ruins on the private land but even these are no longer present.

### 2.22.5 Safety

No safety concerns were noted on KNF-administered land at the Snowshoe mine and mill site. Pioneer Technical Services (1995) did mention the presence of three open and hazardous adits on patented ground along with unstable waste piles. Pioneer ranked the Snowshoe with an AIMSS safety score of 69.39 which ranked it 48$^{th}$ out of over 500 sites.

**2.23 Cherry Creek or St. Paul Mill**

2.23.1 Site Location and Access

This mill site was not in the MILS data base but was identified by Pioneer Technical Services (1995) as a ranked site in their study. MBMG mineral property files list it as the "St. Paul" mill. It is easily accessible to within 300 feet of the site by the improved gravel road.

2.23.2 Site History-Geologic Features

This mill was built to process the ore and tailings from the Snowshoe mine. It is unclear if there was more than one or two subsequent mills at this site. A report from the MBMG mineral property files (1945) stated that a mill was processing 50 tons per day. This report said the mill consisted of a ball mill, eight flotation cells, and a filter. The Snowshoe tailings were loaded into trucks and hauled to the mill. There was a 100-ton storage bin at the mill. Sharp (MBMG, unpublished report) said that flotation at the mill recovered only 65% of the silver and lead found in the old tailings. The tailings averaged 1.5% lead, 2.5 % zinc, 1 oz per ton silver, and 0.07 oz per ton gold and that there were (at the most) 25,000 tons of tailings (at the Snowshoe).

The exact dates of operation were not located, but another mill was described in reports as being built in 1958 and being stripped of equipment in 1967. An article in the Wallace Miner newspaper stated that the 100-ton selective flotation concentrator was nearing completion in 1957. All that was left to complete was electrical and plumbing work. The operators at the time were Merger Mines, Inc. and St. Paul Lead Company. By 1967, most of the machinery at the mill had been stripped (MBMG mineral property files). The mill was probably built this far down on Cherry Creek because of the seasonal lack of water at the Snowshoe mine site (as reported in other MBMG reports).

2.23.3 Environmental Condition

The site has been previously reclaimed by recontouring and reseeding. No obvious visible signs of environmental problems were noted. Grass was growing on the reclaimed areas and the surrounding trees appeared healthy. A cross section of the old tailings were exposed in an old road cut where it was sampled.

2.23.3.1 Site Features-Sample Locations

Water-quality samples were collected upstream (CCHS20L) and downstream (CCHS10L) of the site on KNF-administered land. The flow rate at each location was 2,876 gpm. Upstream, Cherry Creek pH was 7.55 and specific conductance was 84 μmhos/cm. Downstream, Cherry Creek pH was 7.6, and specific conductance was 84 μmhos/cm. Two soil/tailings samples were also collected. The first was a vertical composite of the tailings where they were exposed in a road cut. The second was a composite taken across the surface of the reclaimed area. Samples were collected on September 03, 1998. Site features and sample locations are shown in figure 23; photographs are shown in figures 23a and 23b.

### 2.23.3.2 Soil

The soil and tailings samples collected were analyzed by Energy Laboratories, Inc. of Billings. The total cyanide was found to be 5.6 μg/g in CCHT10H and 0.6 μg/g in CCHT20H. Pioneer Technical Services also analyzed for cyanide and found 0.867 mg/kg.

Table 34. Soil sampling results at the Cherry Creek mill (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| CCHT10H-vertical profile | 1784.2[1,2] | 2.398[1] | 248.439[1,2] | 11506.06[1,2] | 1672.817[1,2] |
| CCHT20H-horizontal profile | 41.19[1] | 3.251[1] | 32.84[1] | 1366.828[1,2] | 758.781[1,2] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).
(2) Exceeds phytotoxic levels (table 3).

### 2.23.3.3 Water

The concentration of analytes in the upstream sample (CCHS20L) and downstream sample (CCHS10L) did not exceed any water-quality standards (table 2). The tailings site was at least 50 feet from the creek and about 20 feet higher than the creek.

Table 35. Cherry Creek mill water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (CCHS20L) upstream on Cherry Creek | | | | | | | | | | | | | | | | | | | |
| (CCHS10L)-down-stream on Cherry Creek | | | | | | | | | | | | | | | | | | | |

Note: The analytical results are listed in appendix IV.

### 2.23.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. The area to the

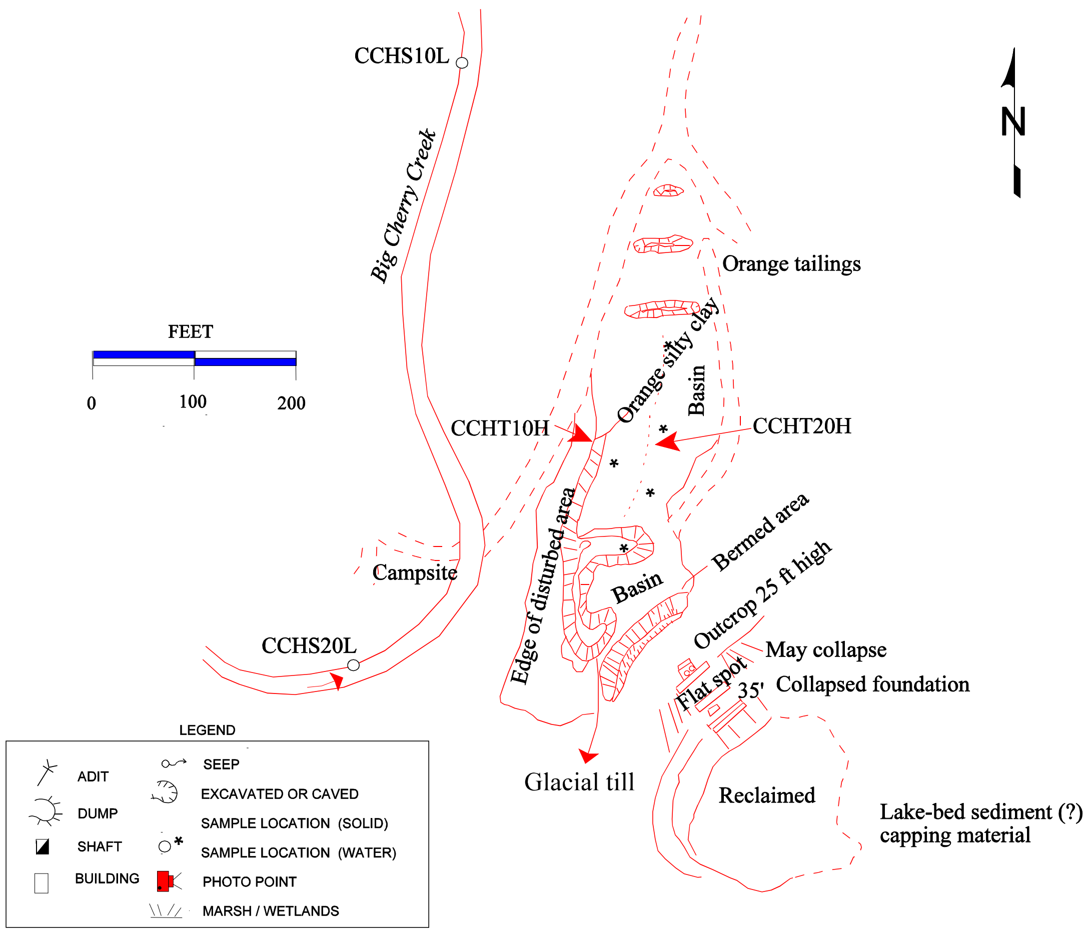


Figure 23. The reclaimed Cherry Creek mill was sampled in two locations, and the stream was sampled on 09/04/98.

Figure 23a.Tailings sample CCHT10H from the Cherry Creek mill was taken from a thick remnant of the pile.

Figure 23b. The foundation of the mill at the Cherry Creek site posed a safety threat because of erosion at the footings.

southeast of the mill foundation has been recontoured and seeded in grasses. The flat areas that were probably tailings have also been seeded with grasses. Trees did not show any effects of the milling waste and small “islands” of trees grew in the flat tailings areas. Small trees also have begun to encroach and revegetate the area. The road leading to the site also has been closed off and has trees beginning to obliterate it.

2.23.3.5 Summary of Environmental Conditions

The Cherry Creek mill site showed no effects on the water-quality of Cherry Creek, although samples by Pioneer Technical Services (1995) showed an observed release of arsenic to the sediment in the creek.

2.23.4 Structures

The mill building and all equipment were removed in the 1980's or before. Only the concrete foundations of the mill remain. The bridge that previously crossed the river at this location also has been removed.

2.23.5 Safety

The mill and equipment have been totally removed, however, three large concrete foundations remain. One has fallen over probably due to undermining by erosion, and another showed signs of erosion. Pioneer Technical Services ranked the Snowshoe with an AIMSS safety score of 13.22, which ranked it 98$^{th}$ out of over 500 sites.

## 2.24 Victor-Empire Mine

2.24.1 Site Location and Access

The Victor-Empire mine is on the north side of Granite Creek along the Granite Creek Trail approximately three quarters of a mile from the trailhead. The site is accessed by taking the Shaughnessy Road off of Highway 2 for 1.2 miles, then turning right onto Granite Lake Road for 0.8 miles, then left on Forest Route 618 (Granite Creek Road) for another 7.5 miles where the road dead ends at the Granite Creek trailhead.

2.24.2 Site History-Geologic Features

The Victor-Empire mine development consists of a 2,000-foot adit on the Snowshoe fault and a short drift on a branching fault in Ravalli sedimentary rock (Johns, 1970). A diamond drill hole driven from the end of the 2,000-foot drift along the Snowshoe fault, in a direction a little north of east, was reported to have intercepted a high-grade gold-silver-lead ore at about 940 feet (Gibson 1948). Johns states this 4.5 foot vein assayed at $290 per ton.

The Snowshoe fault zone, from two to five feet wide, contains pyrite, pyrrhotite, and galena in quartz.
East of the fault is quartzite and sandstone of the Ravalli Formation, and on the west side of the fault is argillite and calcareous quartzite of the Wallace Formation (Johns, 1970).

2.24.3 Environmental Condition

The Victor-Empire mine consist of one single open adit that discharges water across the waste-rock dump dissipating into the soil slightly past the dump. There is associated mine trash, steel pipe, sheet metal, etc., piled a short distance on either side of the mine adit. The mine and dump are from 600 to 700 feet uphill from Granite Creek.

2.24.3.1 Site Features-Sample Locations

An adit-discharge sample (GEVS10H) was collected, and upstream (GEVS20L) and downstream (GEVS30L) surface-water samples were collected on Granite Creek. Site features and sample locations are shown in figure 24.

2.24.3.2 Soil

The waste-rock dump comprises country host rock consisting mostly of gray quartzite and shale with some scattered iron-stained quartz. Disseminated chalcopyrite was seen in a few of the rocks within the dump. The dump showed no signs of erosion or instability to impact the surrounding soil. However, analysis of the waste dump shows arsenic exceeds phytotoxic levels, and arsenic, cadium, lead, and zinc exceeded Clark Fork Superfund Levels. Vegetation around the dump showed no signs of stress and appeared healthy.

Table 36. Soil sampling results–Victor Empire mine (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Waste dump (GEVW10H) | 493.25 [1,2] | 1.562 [1] | 11.562[1] | 67.68 [1] | 228 [1] |

(1) Exceeds one or more Clark Fork Superfund Background Levels (table 3).
(2) Exceeds Phytotoxic Levels (table 3).

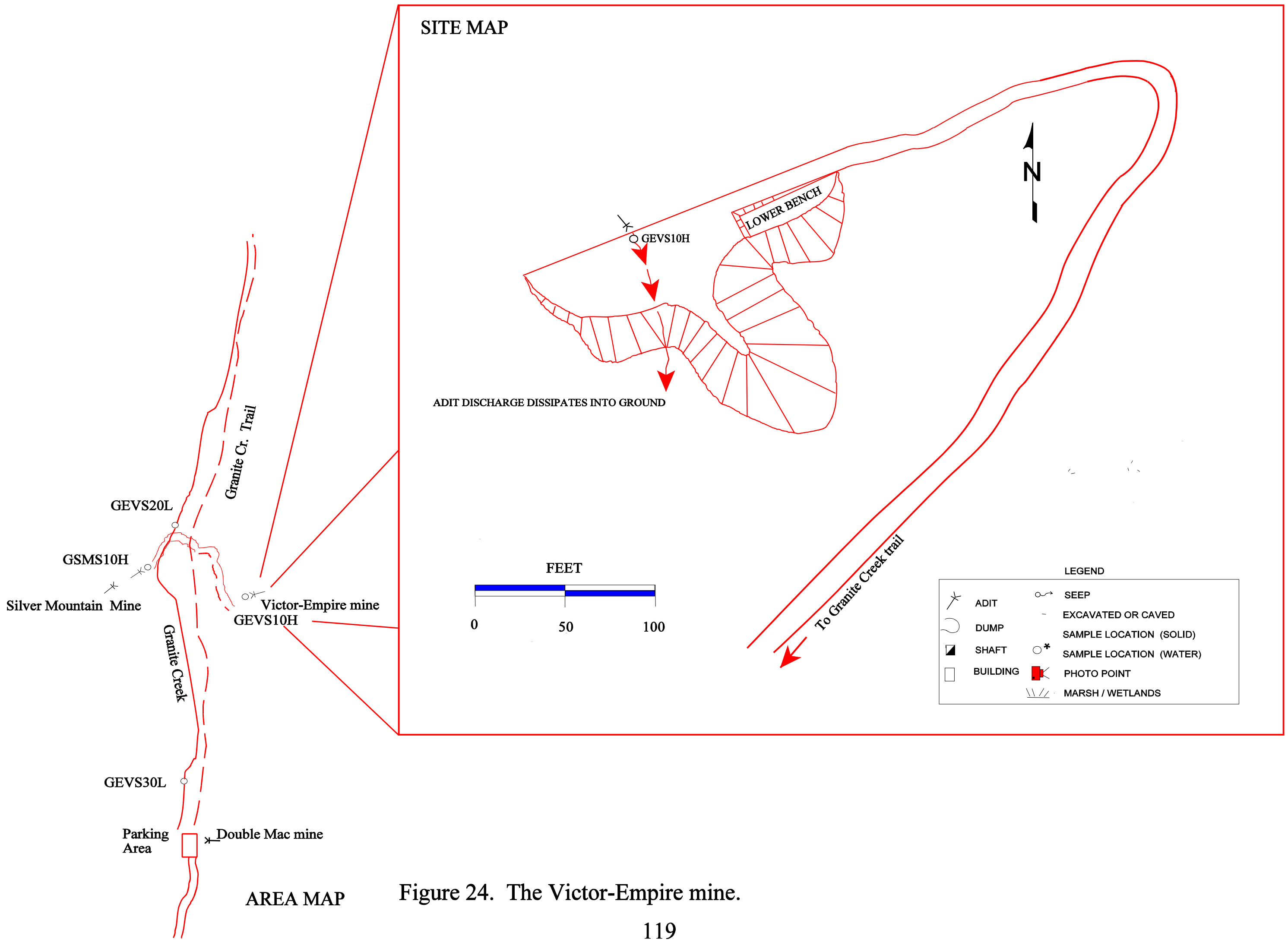


Figure 24. The Victor-Empire mine.

2.24.3.3 Water

An adit discharge was flowing at the time of visit approximately 4 – 5 gpm. Analysis of the water sample showed no constituents tested exceeding MCLs, and there was no iron staining or other visual evidence of poor water quality. The stream samples on Granite Creek also showed good-quality water.

2.24.3.4 Vegetation

Vegetation appeared healthy throughout the site with vegetation re-establishing on the crown of the dump and on the old roads leading to the site.

2.24.3.5 Summary of Environmental Condition

Environmental impact from the site appears limited; the adit discharge from the site is below MCLs, the waste dump is composed mainly of unaltered, unmineralized wall rock, and the site is approximately 700 feet from Granite Creek.

2.24.4 Structures

There are no structures at the site.

2.24.5 Safety

The open adit is a safety concern but the site is not visible from the Granite Creek trail, and few people likely visit the site.

## 2.25 Silver Mountain Mine

2.25.1 Site Location and Access

The Silver Mountain mine is on the south side of Granite Creek along the Granite Creek Trail approximately three quarters of a mile from the trailhead. The site is accessed by taking the Shaughnessy Road off of Highway 2 for 1.2 miles, then turning right onto Granite Lake Road for 0.8 miles, then left on Forest Route 618 (Granite Creek Road) for another 7.5 miles where the road dead ends at the Granite Creek trailhead.

2.25.2 Site History-Geologic Features

The Silver Mountain mine consist of three adits: one above another along the Snowshoe fault and a fault that runs parallel to it (Gibson, 1948). The upper adits are caved and the lower adit blocked off by a wooden door chained and padlocked. According to Gibson the Snowshoe fault is about three feet wide, consisting of breccia, gouge, country rock and vein quartz. Pyrite, arsenopyrite, galena, sphalerite are the more common minerals, occurring in streaks, bands, and disseminated grains in the quartz.

Only high-grade ore was mined in 1910, and several shipments of lead-silver ore were made. A mill was erected in 1936 at the site but operated for only a short period of time. Most of the milling equipment was moved prior to 1964 (Johns, 1970).

2.25.3 Environmental Condition

There is a discharge from the lower adit of the Silver Mountain mine flowing across the upper surface of a small waste-rock dump, dissipating into the dump. The mine and dump are several hundred feet from Granite Creek and do not appear to be impacting the creek.

2.25.3.1 Site Features-Sample Locations

A surface-water sample was collected from the adit discharge flowing approximately three gpm (GSMS10H), and upstream (GEVS20L) and downstream (GEVS30L) surface-water samples also were collected from Granite Creek to assess any impacts to the stream. Site features and sample locations are shown in figure 25.

2.25.3.2 Soil

The waste-rock dump comprises mainly unmineralized gray quartzite country rock, with some scattered milky white quartz with no apparent sulfides. Analysis of the waste dump showed arsenic exceeded phytotoxic levels. Yet, the dump was partially vegetated with minimal signs of erosion and limited, if any, impact to the soils.

Table 37. Waste dump sampling results-Silver Mountain mine(mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Base of waste dump (GSMW10H) | 1434 [1,2] | 3.137 [1] | 31.64 [1] | 828 [1] | 314 [1] |

(1) Exceeds one or more Clark Fork Superfund Background Levels (table 3).
(2) Exceeds Phytotoxic Levels (table 3).

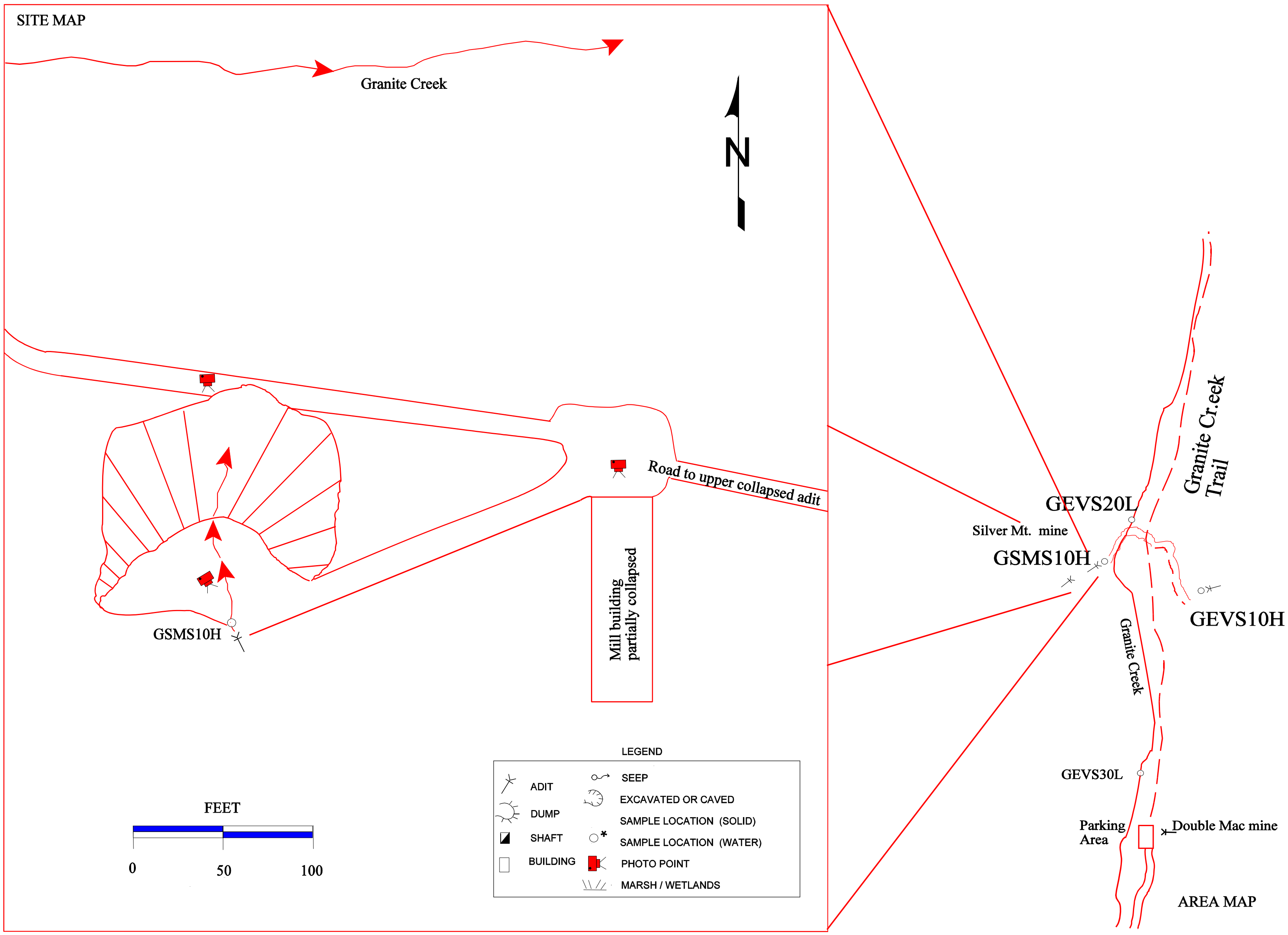


Figure 25. The Silver Mountain mine.

2.25.3.3 Water

None of the surface-water samples exceeded MCLs for any of the dissolved constituents tested. The adit sample showed slightly higher concentrations of arsenic, molybdenum, and zinc than the stream samples but was still well below exceedence levels.

2.25.3.4 Vegetation

Vegetation showed no signs of stress, in fact, trees and undergrowth has started to re-establish on the dumps.

2.25.3.5 Summary of Environmental Condition

Environmental impact from the site appears limited; the adit discharge from the site is below MCLs, the waste dump is composed mainly of unaltered, unmineralized wall rock, and the site is several hundred feet from Granite Creek.

2.25.4 Structures

The only structure at the site is the mill building approximately 175 feet east of the lower mine adit. It is in poor condition, with the front half of the building collapsed and the rest appearing unstable.

2.25.5 Safety

The unstable condition of the mill building is a safety concern, but access to the mine is difficult. The mine is not visible from the Granite Creek trail. One has to forge Granite Creek and follow an overgrown road to the site.

## 2.26 Loyal, Shaughnessy Hill, and Lukens-Hazel Mines

2.26.1 Site Location and Access

These three sites were combined into one summary because of their close proximity to each other and because of the small nature of each disturbance on KNF-administered land. All are close to Libby, Montana, and are reached via Forest Road 618. The Loyal and Shaughnessy Creek sites are behind a locked gate and are adjacent to Plum Creek Timber land. A small spur road leads off of Forest Road 618 in section 5 to the Loyal and Shaughnessy Creek mines. A trail to the south and Horse Creek then branches off of this spur road. This road leads to the Loyal mine in section 6. An obscure trail leads off the switchback on the spur road that leads to the Shaughnessy Creek adit. The Lukens-Hazel (or Glacier Silver-Lead) mine and mill are entirely on private land north of Road 618. The Little Hoodoo Mountain 7.5-min. quadrangle shows adit symbols for all three mines. Access to these mines is generally considered to be easy, although the two upper mines are accessible only by foot. During the site visit, several people were observed using the road for horseback riding, hunting and hiking. A small group of houses is located in section 33, approximately one mile down from the sites.

### 2.26.2 Site History-Geologic Features

The Loyal mine is briefly mentioned in Gibson (1948). A vertical fault cutting a sill in the Wallace calcareous shale was explored by driving an 85 ft adit. Partly oxidized pyrite, galena and sphalerite in quartz associated with the fault was described.

The Lukens-Hazel has been known as Hazel T., Glacier Lead-Zinc and may have been known as the Shaughnessy Hill group. The Lukens-Hazel supposedly consisted of two miles of workings accessed by at least four adits (Gibson, 1948) and was divided into two "lodes": the East vein and the West vein. Both veins were originally quartz and pyrite that were crushed by faulting. The veins were then recemented by later quartz/sulfide deposition. The West vein was the more extensively explored. A 325-ton-per-day (tpd) mill was built prior to 1930 (Gibson, 1948). The mill was inactive in 1936 (Johns, 1970) and was dismantled prior to 1964.

The Shaughnessy Creek adit may be one of the adits mentioned in Gibson (1948) and Johns (1970) as one of the workings included in the Lukens-Hazel description.

### 2.26.3 Environmental Condition

The two small adits on KNF-administered land uphill from the main Lukens-Hazel workings were simple: one adit with a waste dump. The adit at each site was totally caved, and there was a less than one-gpm discharge at both that sunk into the waste dump. The main Lukens-Hazel site was more complex but was on private land and so was not assessed in this study.

#### 2.26.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream of all mining (SLHS20M) and downstream of the mill (SLHS10H) of the site on KNF-administered land. The flow rates at these locations were 40 and 43 gpm, respectively. Upstream, Shaughnessy Creek pH was 7.79 and specific conductance was 125 Fmhos/cm. Downstream, Shaughnessy Creek pH was 8.09 and specific conductance was 277 Fmhos/cm. Samples were collected on September 1, 1998.

The adit discharge at the Loyal (HLOS10H) and the unnamed Shaughnessy Creek adit (SSCS10M) were sampled. Both were sampled from the small pool of water formed by the discharge. Site features and sample locations are shown in figure 26; photographs are shown in figures 26a and 26b.

### 2.26.3.2 Soil

Soil samples were not collected. Neither mine on KNF-administered land had dumps that in contact with surface water or even near any surface water. The Lukens-Hazel was primarily on patented ground.

### 2.26.3.3 Water

The concentrations of analytes in the upstream sample did not exceed any water-quality standards (table 2). The lead concentrations in the downstream sample exceeded the primary chronic aquatic-life standard but had no other problems. The small adit discharge at the Shaughnessy Creek adit exceeded the manganese secondary MCL, and the pH of 6.41 was lower than the secondary MCL. The discharge from the Loyal adit had a fairly high aluminum level that exceeded the secondary MCL and the chronic aquatic-life standard.

Table 38. Lukens-Hazel, Loyal and Shaughnessy Creek mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SLHS20M-upstream of all mining activity | | | | | | | | | | | | | | | | | | | |
| SLHS10H-downstream of mines | | | | | | | | C | | | | | | | | | | | |
| HLOS10H-Loyal adit discharge | S C | | | | | | | | | | | | | | | | | | |
| SSCS10M-Shaugh-nessy adit discharge | | | | | | | | | S | | | | | | | | | | S[1] |

Exceedence codes:

S - Secondary MCL

C - Aquatic Life Chronic

(1) Field pH did not exceed standard.

Note: The analytical results are listed in appendix IV.

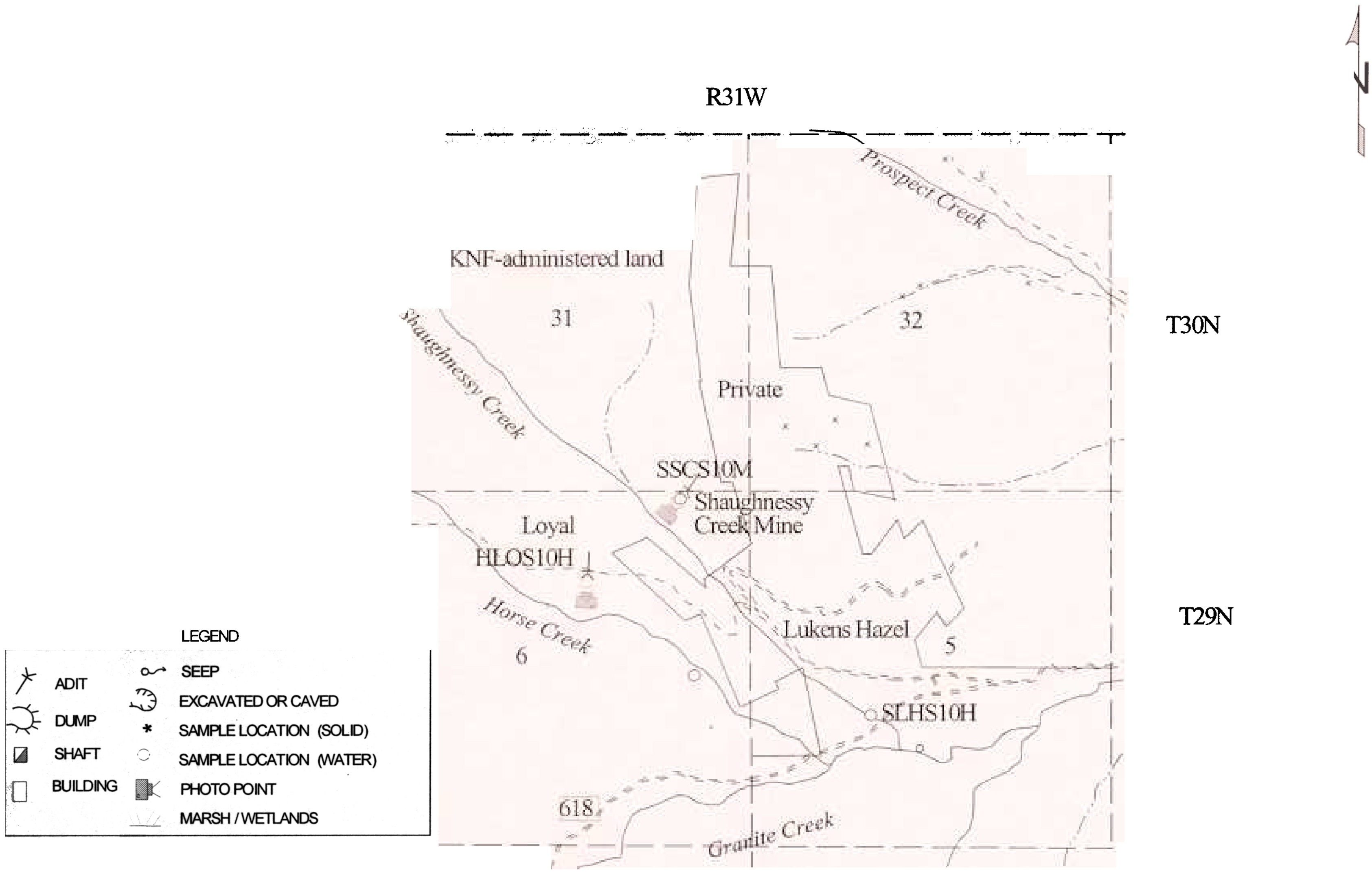


Figure 26. Although the discharges were very small, the cumulative effects were estimated by sampling Shaughnessy Creek.

Figure 26a. The Loyal mine's one collapsed adit was located by following the trail to Horse Creek from the Shaughnessy Creek drainage.

Figure 26b. A small pool of water formed at the caved portal of the Shaughnessy Creek adit. The water was sampled to test the effect of the mine.

2.26.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the two adits. The mill area, on private land, appeared to still be affected by the mining activity (as viewed from the road). The fire that destroyed the mill may have caused the vegetation in the area to be stunted and prohibited new growth.

2.26.3.5 Summary of Environmental Conditions

The KNF-administered land associated with these sites had not been affected by mining activity. Some of the private land may have been impacted.

2.26.4 Structures

All structures are on private property and none were evaluated or inventoried.

2.26.5 Safety

Both adits on KNF-administered land were completely caved and so were not considered hazardous. The sites were not readily accessible because of the locked gate on private land.

## 2.27 Grouse Mountain and Iron Mask Mines

2.27.1 Site Location and Access

These two sites were combined because they are in close proximity and on the same side of the ridge. They are approximately one mile apart in direct distance. The Iron Mask mine is located primarily on patented land on the Spar Lake 7.5-min. quadrangle in BACB section 14, T30N, R34W at an elevation of approximately 3,560 ft. An improved gravel road leads to the mine and beyond but is gated and locked at the bottom.

The Grouse Mountain mine is located on the Troy 7.5-min. quadrangle in CABA section 10, T30N, R34W. Access is difficult, the road is almost entirely overgrown and the best access is by hiking up the bottom of a tributary to Carr Draw. This site is also almost entirely on patented land.

### 2.27.2 Site History-Geologic Features

This area was first explored in the 1890's and was being worked in the 1930s when Gibson (1948) described the area. The adit started in the Prichard Formation and then explored the mineralization in the Grouse Mountain metadiorite dike (Gibson, 1948). The workings totaled 3,000 ft of drifts (Johns, 1970). Lenticular and faulted veins in a shear zone contact of the dike hosted the mineralization. These quartz-calcite veins carry galena, pyrrhotite, arsenopyrite, sphalerite, pyrite, and chalcopyrite (in decreasing order of abundance).

Total production at the Iron Mask was listed in Gibson (1948) as approximately 200 tons from the years of 1892 to 1931. More development was done in 1943, when Montana Mining and Milling Company leased the property and the Giant Sunrise mill. They produced nine tons of lead concentrate and 23 tons of zinc concentrate (Johns, 1970). Ernie Williams was still working the property in 1997 when visited. The property consisted of two patented claims with two 300 ft adits (Gibson, 1948). Lead, zinc, silver and gold were recovered from galena, sphalerite, arsenopyrite, pyrrhotite, pyrite, and chalcopyrite in a quartz, calcite, chlorite, and hornblende gangue (Gibson, 1948). This property also explored the highly altered Grouse Mountain dike.

### 2.27.3 Environmental Condition

The Iron Mask had a small adit discharge on private land that flowed into the waste dump and exited on KNF-administered land. The drainage that came from the mine flowed only intermittently before entering into the North Fork of Keeler Creek.

The Grouse Mountain mine waste dumps were in contact with the small tributary to Carr Draw. The stream was flowing in October 1997 and showed signs of having a larger flow earlier in the year.

#### 2.27.3.1 Site Features-Sample Locations

Both sites are primarily on patented land but were sampled only on KNF-administered land. Water-quality samples were collected from only downstream (KIMS10H) of the Iron Mask site on KNF-administered land. The flow rate at this location was estimated at 0.5 gpm. Downstream, the small tributary of the north Fork of Keeler Creek had a pH of 7.41 and specific conductance was 211 Fmhos/cm. Samples were collected on October 01, 1997. Site features and sample locations are shown in figure 27; photographs are shown in figures 27a and 27b.

Water-quality samples were collected from upstream (CGMS10L) and downstream (CGMS20M) of the Grouse Mountain site on KNF-administered land. The flow rates at each location was estimated at three gpm. Upstream, the small tributary to Carr Draw had a pH of 7.63 and specific conductance was 93 Fmhos/cm. Downstream, the same tributary had a pH of 6.6 and specific conductance was 27 Fmhos/cm. Samples were collected on October 01, 1997. Site features and sample locations are shown in figure 28; photographs are shown in figure 28a.

### 2.27.3.2 Soil

One soil sample (KIMD10H) was collected at the base of the waste dump. It showed elevated levels of all metals. This sample was soil mixed with some waste.

Table 39. Soil-sampling results at the Iron Mask mine and mill (mg/kg).

| Sample Location | As | Cd | Cu | Pb | Zn |
|---|---|---|---|---|---|
| Soils/waste mix (KIMD10H) | 3121[1,2] | 59.6[1,2] | 56.5[1,2] | 1489[1,2] | 1981[1,2] |

(1) Exceeds one or more Clark Fork Superfund background levels (table 3).
(2) Exceeds phytotoxic levels (table 3).

### 2.27.3.3 Water

The concentration of analytes in the upstream sample (CGMS10L) did not exceed any water-quality standards (table 2). The concentration of cadmium and zinc in the downstream sample exceeded the chronic aquatic-life standards. The Iron Mask had an exceedence of the primary MCL of aluminum but had no other problems.

Table 40. Grouse Mountain and Iron Mask mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CGMS10L-upstream of Grouse Mountain | | | | | | | | | | | | | | | | | | | |
| CGMS20M -down-stream Grouse Mtn | | | | C | | | | | | | | | AC | | | | | | |
| KIMS10H-down-stream of Iron Mask | P | | | | | | | | | | | | | | | | | | |

Exceedence codes:
- P - Primary MCL
- A - Aquatic Life Acute
- C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

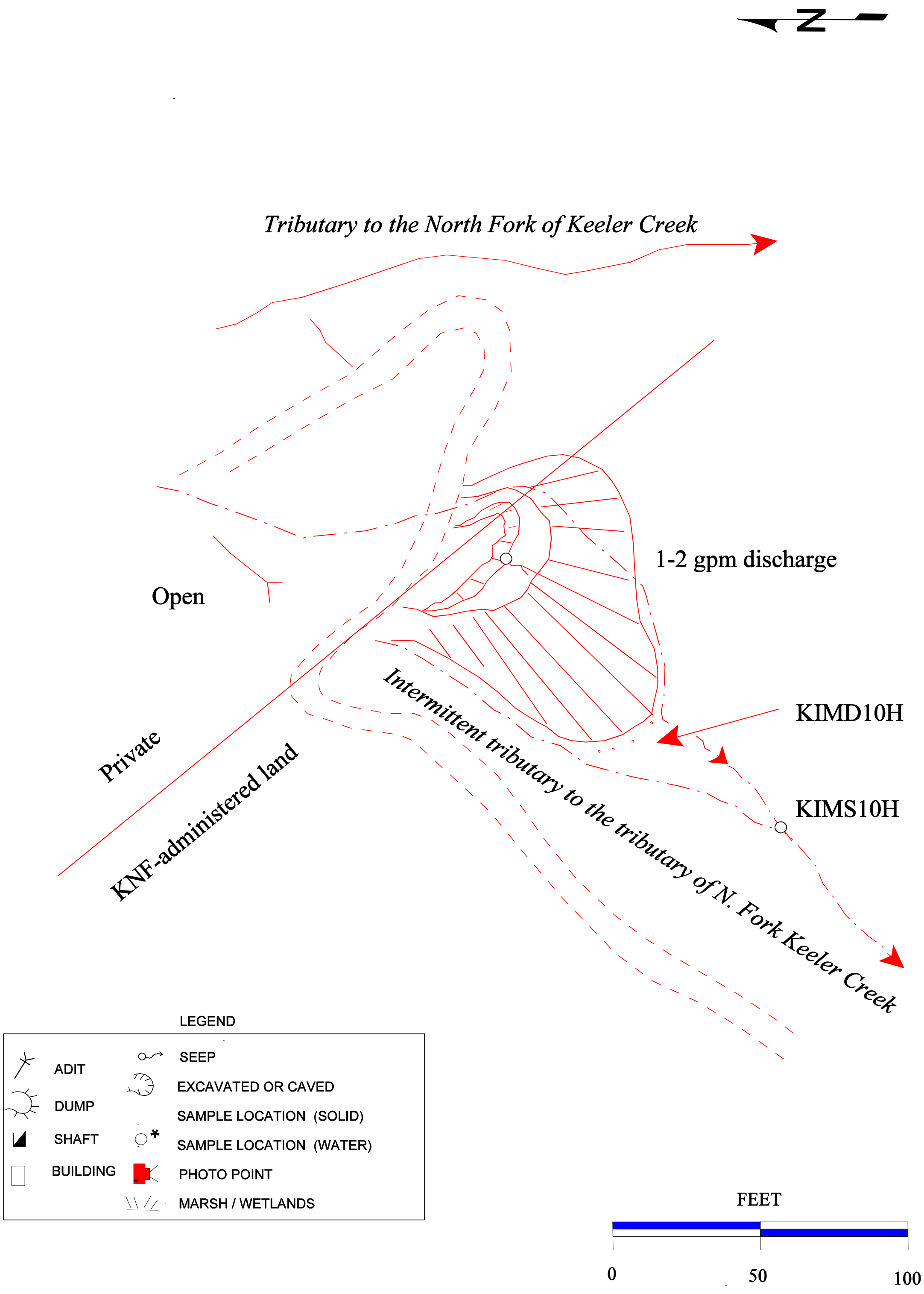


Figure 27. The Iron Mask mine was largely on patented land, but the seep from the waste dump was on KNF-administered land, as mapped 10/01/97.

Figure 27a. The intermittent drainage that is a tributary to Carr Draw eroded the Grouse Mountain mine's waste dump.

Figure 27b. A 0.5-gpm seep was found on KNF-administered land on top of the waste dump at the Iron Mask.

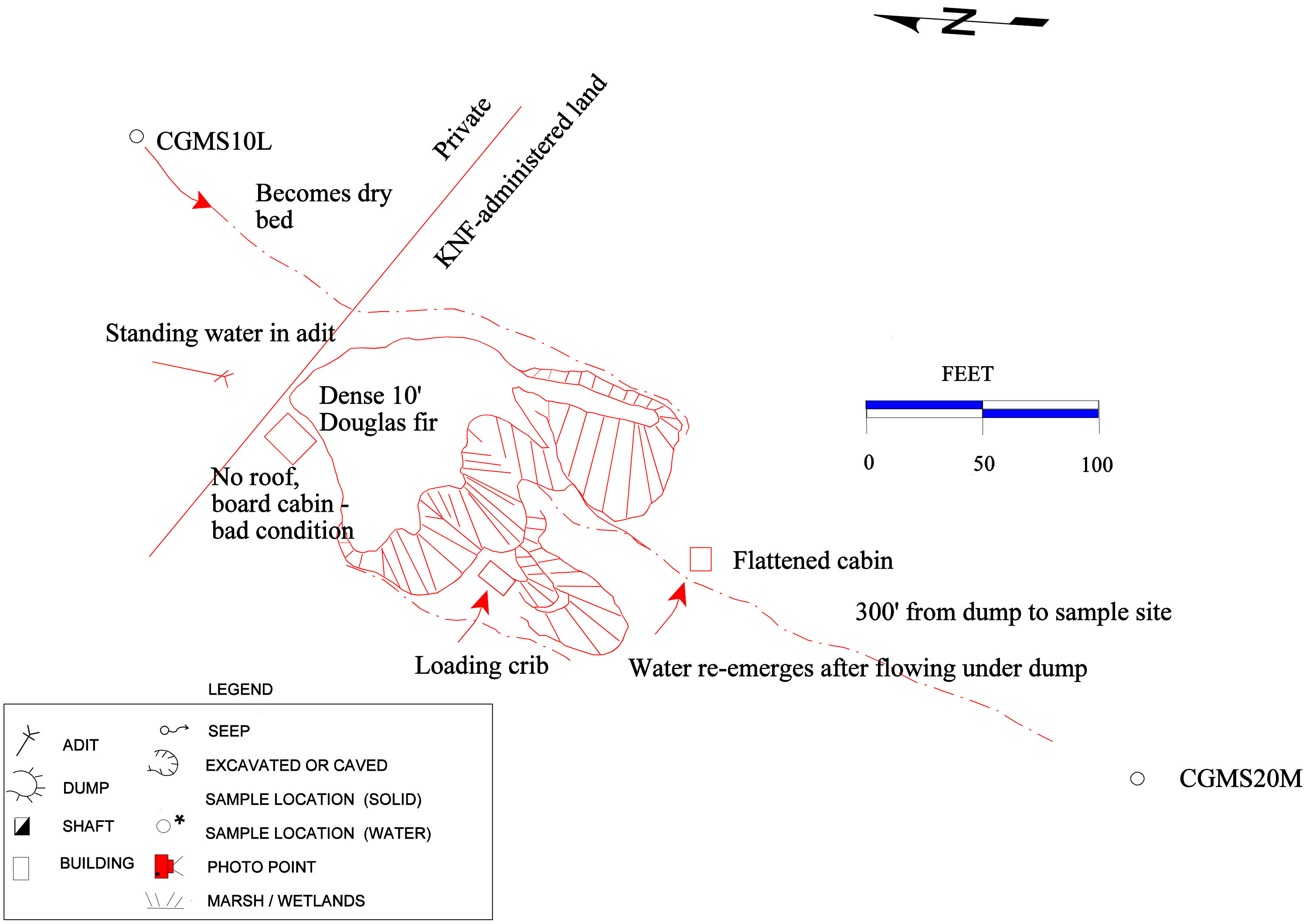


Figure 28. An open adit at the Grouse Mountain mine had standing water, and a small seep flowed from the base of the waste dump as mapped 10/01/97.

Figure 28a. Photos of the Grouse Mountain mine show the waste that was dumped in the drainage.

2.27.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be significantly impacted by the sites. The waste dump at the Grouse Mountain mine was heavily revegetated on the flat top but only sparsely to moderately revegetated on the flanks. This was probably due to the lack of soil in these areas. Trees grew up to the edge of the dump and appeared healthy. Most impacts at the Iron Mask were on patented land but no impacts to the vegetation was noted. Again, the waste dump was only moderately vegetated but had little soil development.

2.27.3.5 Summary of Environmental Conditions

These two sites contribute only a small amount of metals to the local area and do not appear to have an effect on the surrounding KNF-administered land.

2.27.4 Structures

All structures are on private property and were not evaluated or inventoried. The Grouse Mountain did have an old ore bin and a collapsed cabin on private land. There were originally several cabins, a blacksmith shop, and an ore bin at the Grouse Mountain mine. No structures at all were noted at the Iron Mask.

2.27.5 Safety

The site was largely private and was not evaluated for safety. The surrounding KNF-administered land had no safety concerns.

## 2.28 Giant Sunrise Mine and Sunrise Mill

2.28.1 Site Location and Access

The Giant Sunrise (or Montana Sunrise) is located on a tributary of Copper Creek in BBBC section11, T30N, R34W at an elevation of 3,720 ft. The drainage is an unnamed creek draining from the east flank of Grouse Mountain. The site is entirely on KNF-administered land.

The Sunrise mill is located in DABC section 02, T30N, R34W at an elevation of 2,715 ft. It lies entirely on patented ground but the effects to KNF-administered land could be estimated by sampling on federal land downstream on Copper Creek.

### 2.28.2 Site History-Geologic Features

The Giant Sunrise property was found in 1928 (Johns, 1970). At least five adits worked the property (Gibson, 1948), exploring a northwest-trending dike in Prichard Formation. These adits totaled over 7,855 ft of workings. It is not evident if this dike is somehow related to the Grouse Mountain metadiorite dike or not. The ore minerals include pyrrhotite, sphalerite, galena, chalcopyrite, pyrite, and ilmenite (Gibson, 1948). Gibson (1948) stated that a 100-tpd mill was built at the Giant Sunrise in 1934. Johns (1970) stated that this was a 200-ton mill and that it was dismantled in 1958 (Johns, 1970); it was active in 1935 and 1936 but was idle in 1939. Johns (1970) also states that the Iron Mask and Montana Morning properties and the “25-ton Giant Sunrise mill” were leased in 1943 by the Montana Mining and Milling Company. It is unclear whether this is a misquote or if Johns was correct. The report doesn’t directly say but it seems this mill was built at the Giant Sunrise site and is a different one than the Sunrise mill to the northeast and down the valley.

The Sunrise mill is located approximately one mile to the northeast of the Giant Sunrise. No information on its history could be found in literature. It may have processed ore from many of the small mines in the area.

### 2.28.3 Environmental Condition

Mine waste is in the flood plain of the unnamed tributary to Copper Creek. Several seeps emanate from the toe of the main waste dump. This may be the result of the infiltration of the standing water in the adit at the top of the waste dump.

The Sunrise mill is on private land. As observed from KNF-administered land, it appeared that most of the remaining sediment is cobble-sized with willows and cottonwood trees growing on it.

#### 2.28.3.1 Site Features-Sample Locations

Water-quality samples were collected from the adit at the Giant Sunrise (CGMS10M) and downstream (CGMS20M) of the site on KNF-administered land. The flow rates at these locations were 0.2 and 1 gpm, respectively. The adit discharge’s pH was 7.24 and the specific conductance was 129 Fmhos. Downstream, at the seep at the base of the waste dump, the pH measured 6.2 and specific conductance was 121 Fmhos/cm. The pH of the sample downstream on Copper Creek measured 7.19 and the specific conductance was 57 Fmhos. More samples were not collected because of the private land position. Samples were collected on October 2, 1997. Site features and sample locations at the Giant Sunrise are shown in figure 29; photographs are shown in figures 29a and 29b. Site features and sample location at the Sunrise mill are shown in figure 30; photographs are shown in figures 30a and 30b.

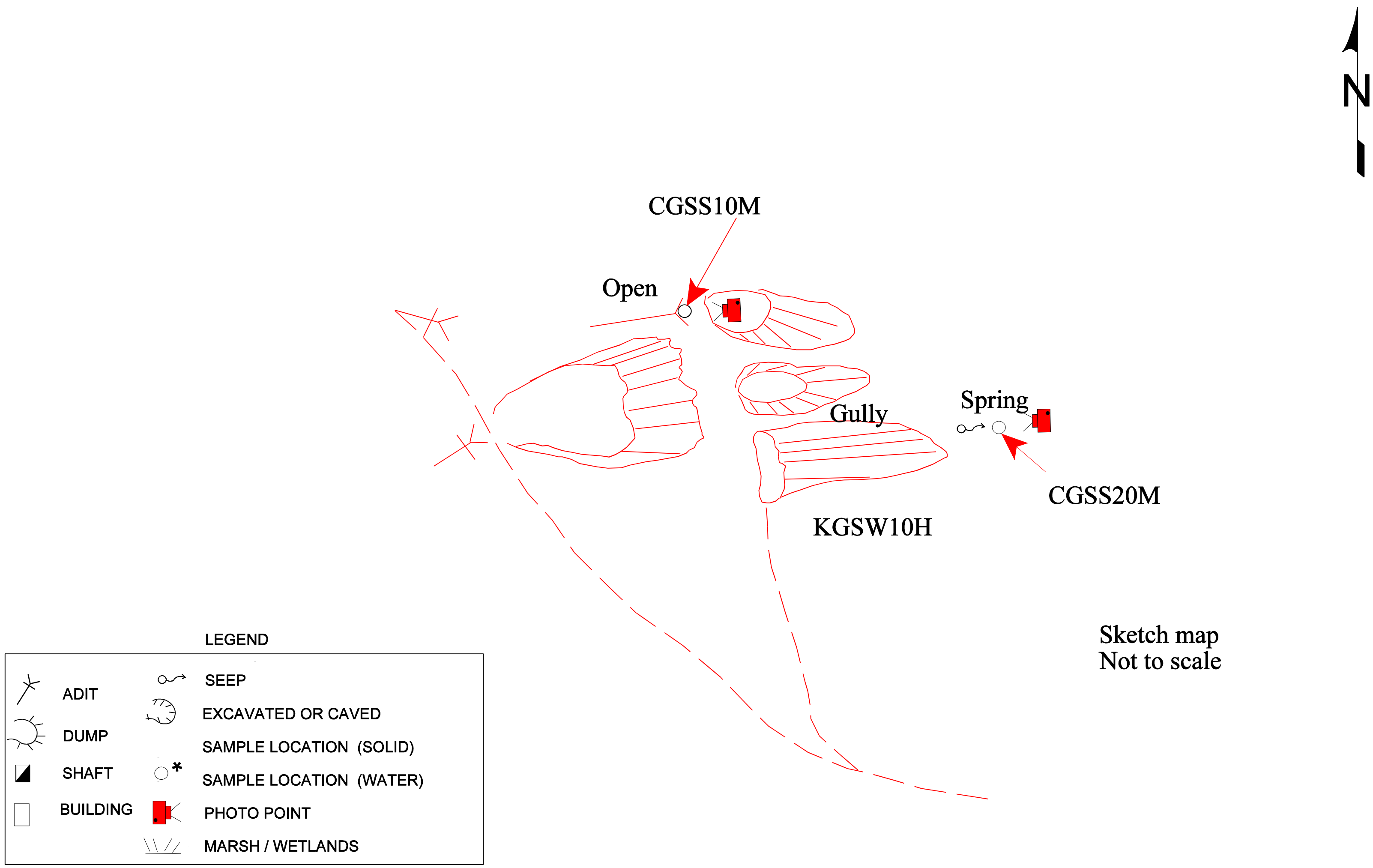


Figure 29. The small seep at the base of the waste dumps at the Giant Sunrise mine may be an expression of the water standing in the open adit, as inventoried October 2, 1997.

Figure 29a. The open adit at the Giant Sunrise held standing water but none was flowing at the surface to the active drainage.


Figure 29b. The waste dump had been eroded by runoff, and a small seep flowed from the base of the dump.

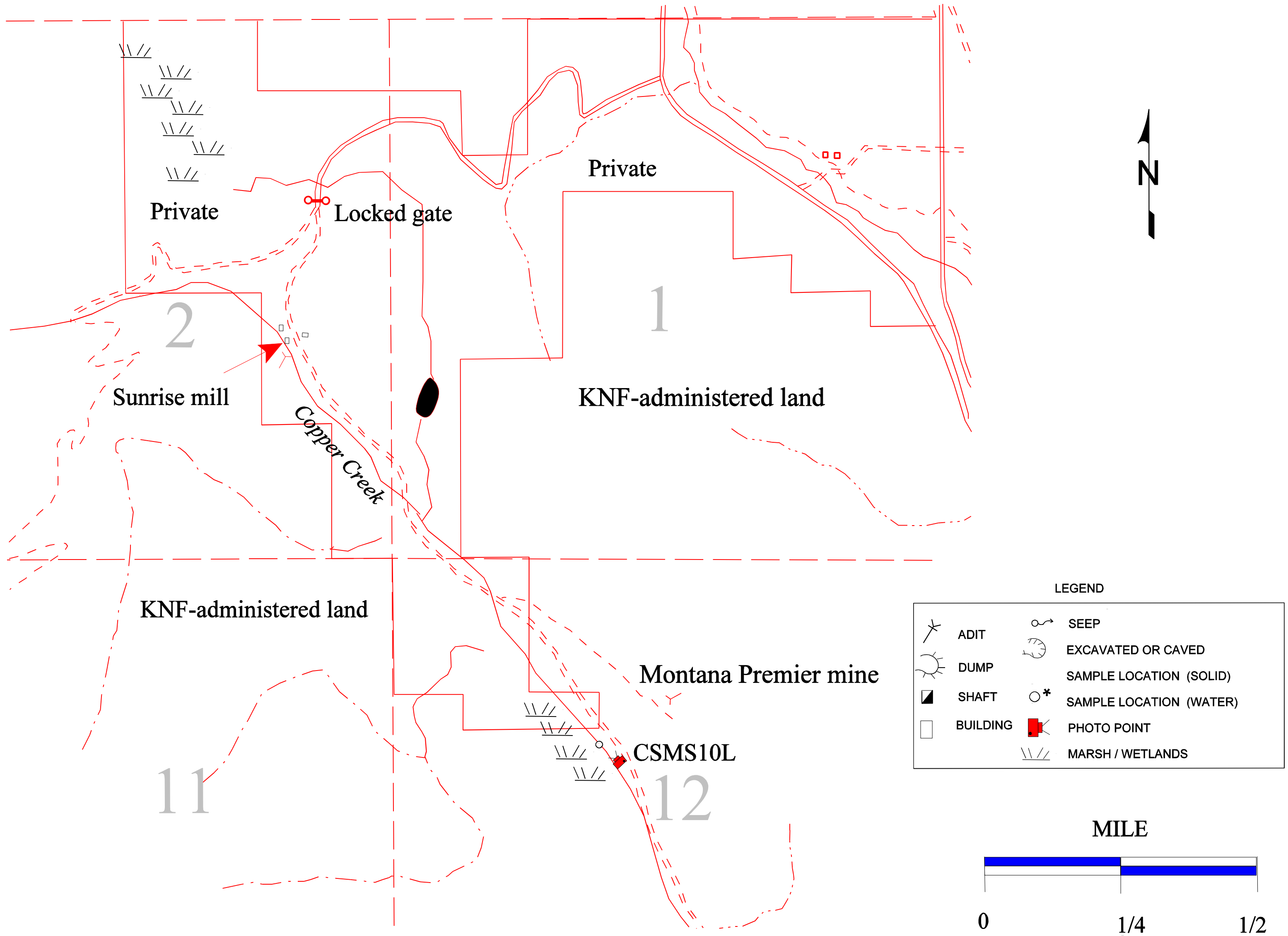


Figure 30. The Sunrise mill sat on private land but its effects were roughly estimated by sampling downstream on Copper Creek, as inventoried October 2, 1997.

Figure 30a. As seen from KNF-administered land, the tailings were fairly well vegetated and the tailings were dry.

Figure 30b. The water at the sample site on Copper Creek was fairly stagnant, but the vegetation appeared very healthy.

2.28.3.2 Soil

No soil or waste samples were collected because of the private land and because the waste dumps were directly in contact with the drainage.

2.28.3.3 Water

The concentrations of analytes in the adit-discharge sample did not exceed any water-quality standards (table 2) but the lab pH was 8.56 while the field ph was 7.24. The downstream or seep sample had an exceedence in lead and again the field pH was 6.2 while the lab pH was an acceptable 7.52. The concentration of iron in the sample downstream from the mill exceeded the secondary MCL but had no other problems.

Table 41. Giant Sunrise mine and Sunrise mill water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CGSS10M-adit discharge | | | | | | | | | | | | | | | | | | | S[1] |
| CGMS20 -downstream of the mine | | | | | | | | C | | | | | | | | | | | S[1] |
| CSMS10L-downstream of the mill | | | | | | | S | | | | | | | | | | | | |

Exceedence codes:
S - Secondary MCL
C - Aquatic Life Chronic
(1) Laboratory pH or field pH did not exceed standard.
Note: The analytical results are listed in appendix IV.

2.28.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site.

2.28.3.5 Summary of Environmental Conditions

Effects of the Giant Sunrise mine were local, and the discharge was extremely small.

2.28.4 Structures

All structures at the Sunrise mill were on private property and were not inventoried for this study. From KNF-administered land, it was observed that several buildings in good condition were on the property.

2.28.5 Safety

The open adit was a concern at the Giant Sunrise. McCulloch (oral communication, 1999) reported conducting a field evaluation with the lessee. At that time, the mine was open but low oxygen conditions were encountered in the adit. The remaining cabins were in fair-to-bad condition and may pose a safety threat.

## **2.29 Goat Creek Adit** (name coined for current inventory)

2.29.1 Site Location and Access

This unnamed adit on Goat Creek may be accessed by either a hiking trail from Callahan Creek (Forest Trail 152) or by cutting down the hill from the clearcut above (as done in this study). The trailhead was not evident from the road and may not be maintained. The site was accessed by driving 4.5 miles from the South Fork of Callahan Creek road junction and walking down through a clearcut to a faint trail along the creek. Walking was difficult because of the steepness of the topography and numerous blowdowns. The adit is located on the Smith Mountain 7.5-min. quadrangle in BDCD section 31, T31N, R34W at an elevation of 3,200 ft.

2.29.2 Site History-Geologic Features

No references were found for this site and no name could be attached to it. The name "Goat Creek adit" was coined for this study. The site lies 1¾ miles south-southwest of the Snowstorm mine. If the N25EW trend of the dike and veins at the Snowstorm mine is followed, the Goat Creek adit is on the same trend. The rock on the waste dump was primarily quartzite (Prichard ?) with a small amount of white quartz containing sparse sulfides. No intrusive was noted at Goat Creek.

2.29.3 Environmental Condition

The waste dump was the only environmental concern noted. It was in direct contact with the active flow of the creek. The waste was primarily large blocks of hard quartzite and did not appear to be easily eroded. The entire area of disturbance was less than one acre.

2.29.3.1 Site Features-Sample Locations

The waste dump was in contact with Goat Creek for approximately 50 feet. Water-quality samples were collected from upstream (GGMS10L) and downstream (GGMS20L) of the site on KNF-administered land. Each flow rate was estimated at 898 gpm. Upstream, Snowshoe Creek pH was 6.24 and specific conductance was 26 Fmhos/cm. Downstream, Snowshoe Creek pH was 6.6 and specific conductance was 27 Fmhos/cm. Samples were collected on October 2, 1997. Site features and sample locations are shown in figure 31; photographs are shown in figures 31a and 31b.

2.29.3.2 Soil

There was no soil to sample between the waste dump and the creek. There was also no evidence of metals leaching into the creek. Soil samples were not taken.

2.29.3.3 Water

The only exceedence of water-quality criteria was the field pH in the upstream sample that measured 6.24, but the laboratory pH measured and acceptable 7.86 (table 2).

Table 42. Goat Creek adit water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GGMS10L-upstream of site | | | | | | | | | | | | | | | | | | | S[1] |
| GGMS20-downstream of site | | | | | | | | | | | | | | | | | | | |

Exceedence codes:
S - Secondary MCL
(1) Laboratory pH did not exceed standard.
Note: The analytical results are listed in appendix IV.

2.29.3.4 Vegetation

The vegetation did not appear impacted by the site. Few plants grew on the waste dump except for mosses and a few grasses. This was probably a function of the tree canopy and the lack of soil on the waste dump. Trees grew in the collapsed mine portal and adjacent to the dump.

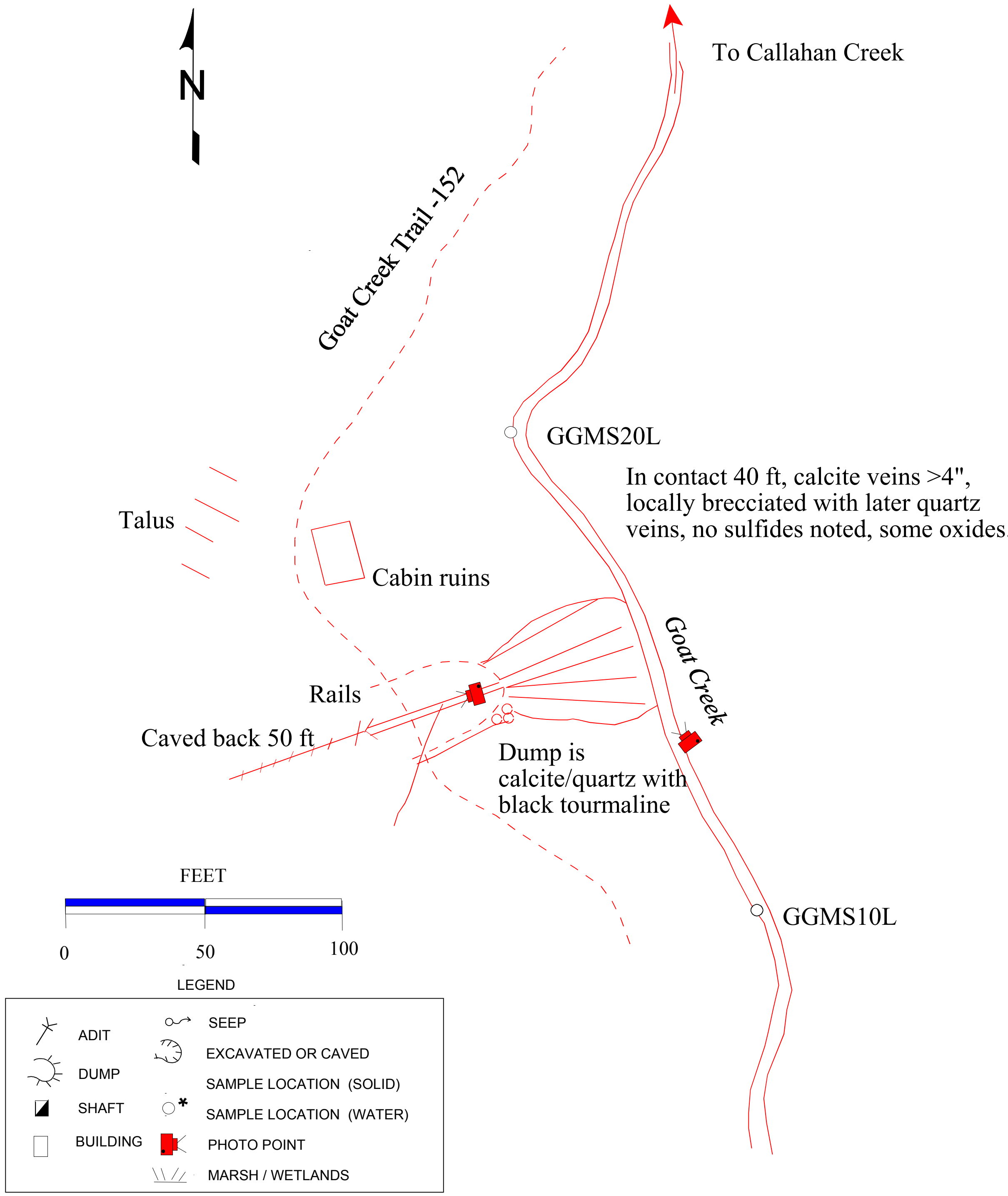


Figure 31. The Goat Creek adit's waste dump was in contact with Goat Creek for approximately 40 ft, as inventoried October 2, 1997.

Figure 31a. The caved Goat Creek adit is barely discernible to the left of the green backpack. There was no evidence of any adit discharge.

Figure 31b. The sparsely vegetated waste dump was in direct contact with Goat Creek. The large size of the fragments that compose the dump inhibits erosion of the waste.

2.29.3.5 Summary of Environmental Conditions

This site is small; it was sampled more for the sake of completeness and impartiality—not because it was thought to impact KNF-administered land. The site was noted by an adit symbol on the 7.5-min. quadrangle but had no other references.

2.29.4 Structures

A collapsed log structure was located approximately 50 ft to the east of the site. A few artifacts remained but otherwise it was in total ruins.

2.29.5 Safety

Although the site was adjacent to a marked trail, the access was not easy. The waste dump was steep and rocky, but few visitors probably ever use this trail. No other safety concerns were noted. The adit was completely caved and marked only by a depression.

## 2.30 Snowstorm Mine

2.30.1 Site Location and Access

The Snowstorm mine can be found approximately five miles up Callahan Creek. The road is washed out approximately one mile before the mine. The original mine road paralleling Callahan Creek is almost completely obliterated by floods. The site was accessed by walking the final mile and fording Callahan Creek on foot. The mine is located on the Troy 7.5-min. quadrangle in CCBC section 20, T31N, R34W at elevations ranging from 2,600 ft to 3,400 ft. Most of the disturbances at the Snowstorm are patented, but one adit was found east of the main area that was on KNF-administered land. An old mill also was found half torn down adjacent to the adit.

2.30.2 Site History-Geologic Features

The Snowstorm was one of the largest producers in the area. It was originally called the B. and B. (Gibson, 1948). The Big Eight patented claims lie to the north along the same trend. Production from the Snowstorm was recorded from 1917 through 1928, but it was worked for some years prior to 1905 (Gibson, 1948). This report listed production previous to 1930 from the Snowstorm as more than $4,000,000 in lead, zinc, gold, and silver. The ore had been shipped by train to a mill at Troy from 1916 until the mill burned in 1927. There was no mention in literature of the partially dismantled mill found on site.

The geology of the area is dominated by replacement veins in a NW-trending mafic dike that was as wide as 54 ft in some of the workings. The Prichard host rock was essentially barren according to Gibson. The veins contained galena, sphalerite, pyrrhotite, pyrite, chalcopyrite, and arsenopyrite. The ore minerals were mixed with chlorite and amphibole.

Workings at the Snowstorm reportedly consisted of at least seven adits with large, stoped areas.

## 2.30.3 Environmental Condition

Floods have washed away much of the streamside waste at the Snowstorm and the Big Eight. This waste was located on private land, and the site was viewed from the creek bed. Mine-related buildings remain but are on private land. Two were in imminent danger of collapsing the Callahan Creek when visited in 1997. The open adit discharges water that finds its way into Callahan Creek, but the flow is moderate.

### 2.30.3.1 Site Features-Sample Locations

Water-quality samples were collected from upstream (CSNS10L) and downstream (CSNS20L) of the site on KNF-administered land. The estimated flow rate at each location was 11,220 gpm. Upstream, Snowshoe Creek pH was 10.38 (probably an error due to meter malfunction) and specific conductance was 28 Fmhos/cm. Downstream, Snowshoe Creek pH was 7.86 and specific conductance was also 28 Fmhos/cm. Samples were collected on September 30, 1997. An adit discharge was sampled on KNF-administered land to the east of the main disturbance (CSNS30H). Its field pH was 11 (possibly an error due to a malfunctioning meter or probe?) and specific conductance was 331; the flow was estimated to be five gpm. The lab pH was 8.64. More samples were not collected because of the private land position. Site features and sample locations are shown in figure 32; photographs are shown in figures 32a and 32b.

### 2.30.3.2 Soil

No waste samples were taken because most workings were on patented land and much of the waste had been washed away. The waste dump on KNF-administered land was not in contact with the active drainage.

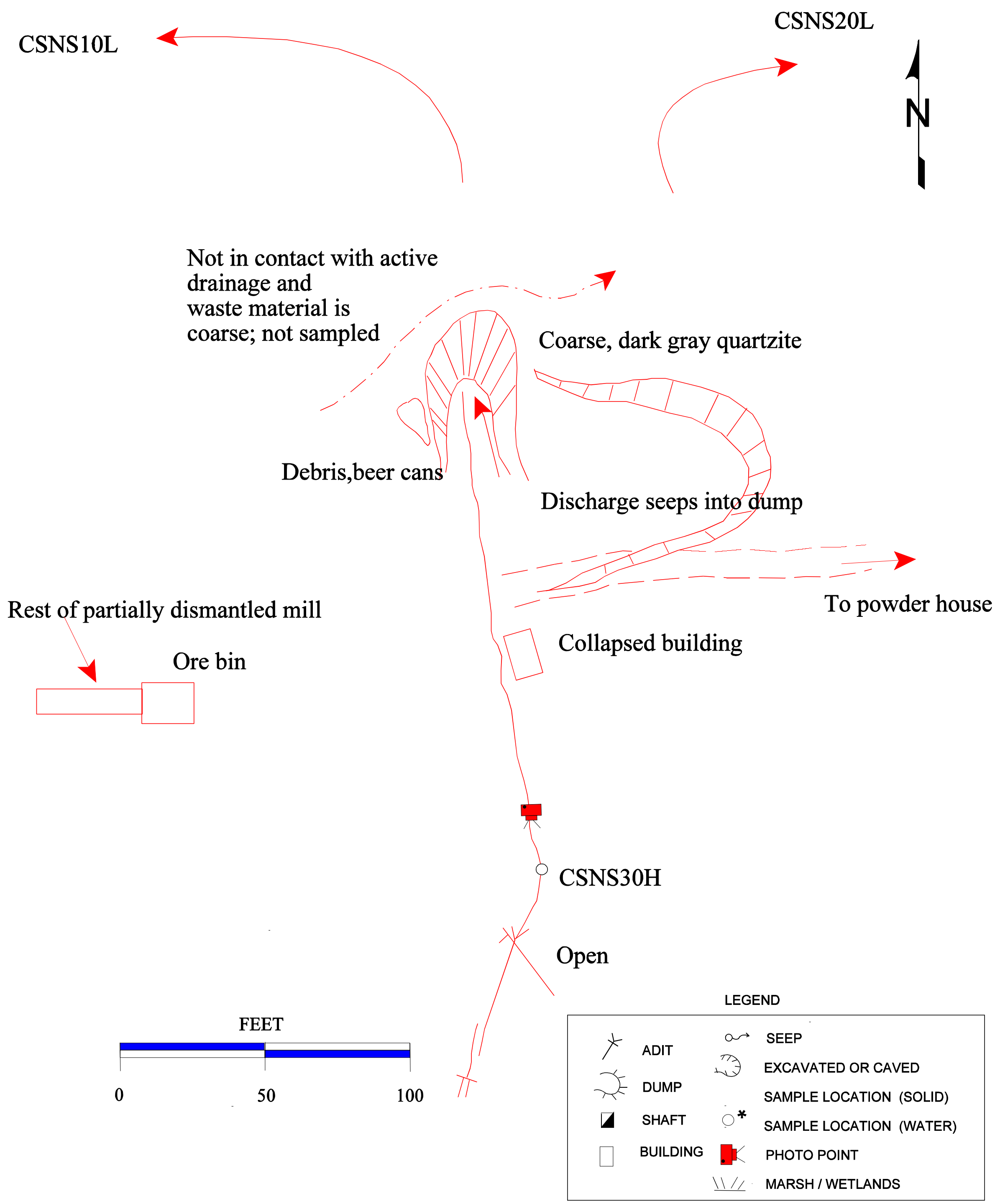


Figure 32. The adit discharge at the Snowstorm seeped into the waste dump before it ever reached an active drainage, as inventoried on September 30, 1997.

Figure 32a. Looking downstream on Callahan Creek, the waste dumps are largely eroded away by spring floods.

Figure 32b. The adit discharge from the open adit at the Snowstorm was sampled in September 30, 1997. The total flow was estimated at five gpm.

2.30.3.3 Water

The concentrations of analytes in the upstream sample (CSNS10L) did not exceed any water quality standards (table 2) in fact, most metals' levels were at or near detection limits. The pH was measured at 10.38 in the upstream sample, but the pH meter may have been malfunctioning because this reading seems abnormally high. The metal concentrations in the downstream sample did not exceed any water-quality criteria but did show a slight increase in the zinc levels. The zinc concentration increased from 5.9 Fg/L upstream to 26 Fg/L downstream. Copper levels also increased from below detection limits to 6.8 Fg/L. Considering the large flow of Callahan Creek, even this slight change could considerably increase the metals loading that occurs.

The adit discharge had even higher levels of zinc (76.1 Fg/L) but the flow was only five gpm. The water appeared clear and cold. The zinc level did not exceed any water-quality criteria.

Table 43. Snowstorm mine water-quality exceedences.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSNS10L-upstream of site | | | | | | | | | | | | | | | | | | | S |
| CSNS20L-downstream of site | | | | | | | | | | | | | | | | | | | S[1] |
| CSNS30H-adit discharge | | | | | | | | | | | | | | | | | | | |

Exceedence codes:
S - Secondary MCL
(1) Laboratory pH did not exceed standard.
Note: The analytical results are listed in appendix IV.

2.30.3.4 Vegetation

Vegetation on KNF-administered land does not appear to be impacted by the site. Mosses and grasses grew right up to the edge of the adit discharge.

2.30.3.5 Summary of Environmental Conditions

Few adverse effects of the mining activity were noted on KNF-administered land in the area of the Snowstorm. No exceedences to water quality were noted, and no evidence of metals loading was found.

2.30.4 Structures

Most structures are on private property and were not evaluated or inventoried. In passing, it was noted that two of the buildings associated with the mine were perched on the edge of the eroded bank of Callahan Creek. A "dry" mine building was in good condition. The mill on KNF-administered land appeared as if someone had salvaged some of the lumber and had left a skeletal building. A powder house on KNF-administered land to the east of the open adit was in good condition and was a unique design—reminiscent of a European-style building with its curved roof and stucco sides. It was empty of any explosives, but evidence was found that it had once been a powder house.

2.30.5 Safety

The private portion of the site was not evaluated for safety, although many buildings were observed from KNF-administered land. The open adit on KNF-administered land was an obvious safety concern, and the half-demolished mill building was attractive to recreationists. The site was remote and was not accessible by car or truck at the time of this visit.

## 2.31 Summary of the Clark Fork, Fisher River, Yaak, and Kootenai River Drainages

Most of the mine and mill sites exhibiting a potential to cause environmental problems on KNF-administered land are scattered in isolated occurrences in the Cabinet Mountains and are associated with Belt rocks. Of the 30 sites that have a potential to adversely affect soil or water quality on KNF-administered land, 17 are entirely on KNF-administered land, five are on private land and seven are on private and public land. Many of the sites were discharging water but most discharges did not make it to nearby streams (faults were associated with many of the mines); several had waste material in contact with the stream. The relative severity of the impacts to KNF-administered land in this area was generally small and impacts were localized.

Repeated visits to some sites exemplify the need for multiple sampling events. At various sites, adits that showed evidence of discharging no longer discharged at the time of the geologist's visit. Also, creeks that may contact mining wastes and carry sediment at times of high flow may have a much lower sediment load later in the summer and fall. Years of exceptionally high precipitation may not accurately reflect the influence of a specific mine.

Some of the sites under consideration were examples of prior attempts at reclamation. The Snowshoe mine and the Cherry Creek mill site were recontoured and reseeded in the late-1980's. The Snowshoe mine has deeply eroded gullies forming in the reclaimed part, while waste with abundant pyrite and galena was in direct contact with Showshoe Creek downstream of the mine. The Cherry Creek millsite does not have a water component to its environmental effects but does have some remnant metals and cyanide associated with the remaining tailings and cover material.

An accurate assessment of the cumulative impact of mining on the drainage would require extensive sampling on private land. Many mining sites were patented and the more extensively developed (and mineralized) areas are the more likely to be patented. Sampling on private land in many cases also would be necessary to determine the impact of the mining upstream.

Other drainages in the Yaak and Tobacco River watersheds also have clusters of mines and mills, but overall the impacts are local. Table 44 lists the mines considered in this report. The exceedence of one or more MCLs is noted for each site as well as the analyses for each sample. All of the samples collected at that site were considered.

Table 44. Summary of water-quality exceedences in the Fisher River drainage.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Snowfall-upstream | | | | | | | | | | | | | | | | | | | |
| Snowfall-adit discharge | | | | | | | | | | | | | | | | | | | |
| Snowfall-downstream of Snowfall prospect | | | | | | | | | | | | | | | | | | | S[1] |
| SKIS10L-downstream of King mine | | | | | | | | | | | | | | | | | | | |
| Viking -upstream | | | | | | | | | | | | | | | | | | | |
| Viking-downstream | | | | | | | | | | | | | | | | | | | |
| Viking-adit discharge | | | | | | | | | | | | | | | | | | | |
| Bramlet Crk-upstream | | | | | | | | | | | | | | | | | | | S |
| Bramlet Crk-downstr. | | | | | | | | | | | | | | | | | | | |
| Gloria-upstream | | | | | | | | | | | | | | | | | | | S |
| Gloria-downstream | | | | | | | | | | | | | | | | | | | |
| Gloria-adit discharge | SC | | | | | | | | S | | | | | | | | | | |

Exceedence codes:
- P - Primary MCL
- S - Secondary MCL
- A - Aquatic Life Acute
- C - Aquatic Life Chronic

Note: The analytical results are listed in appendix IV.

Table 45. Summary of water-quality exceedences in the Clark Fork River drainage.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jack Waite-upgradient | | | | | | | | | | | | | | | | | | | |
| Jack Waite-downstream | | | | | | | | PAC | | | | | | | | | | | |
| Ambassador-upstream | | | | | | | | | | | | | | | | | | | |
| Ambassador-downstr. | | | | | | | | | | | | | | | | | | | |
| Ambassador-discharge | | | | | | | | | | | | | | | | | | | |
| Vermilion-upstream | | | | | | | | | | | | | | | | | | | |
| Vermilion-downstream | | | | | | | | | | | | | | | | | | | |
| Vermilion-discharge | | | | | | | | | | | | | | | | | | | |
| Heidelberg-upstream | | | | | | | | | | | | | | | | | | | |
| Heidelberg-discharge | | | | | | | | | | | | | | | | | | | |
| Heidelberg-dump seep | | | | | | | | | | | | | | | | | | | |
| Heidelberg-downstream | | | | | | | | | | | | | | | | | | | |
| Pilgrim-upstream | | | | | | | | | | | | | | | | | | | |
| Pilgrim-adit discharge | | | | | | | | | | | | | | | | | | | |
| Pilgrim-downstream | | | | | | | | | | | | | | | | | | | |
| Holliday-upstream | | | | | | | | | | | | | | | | | | | S[1] |
| Holliday-upper disch. | | | | | | | | | | | | | | | | | | | |
| Holliday-lower disch. | | | | | | | | | | | | | | | | | | | S[1] |
| Holliday-downstream | | | | | | | | | | | | | | | | | | | |
| Broken Hill-discharge | | | | | | | | | | | | | AC | | | | | | |
| Blue Creek-upstream | | | | | | | | | | | | | | | | | | | |
| Blue Creek-discharge | | | | | | | | | | | | | | | | | | | |
| Blue Creek-seep | | | | | | | | C | | | | | | | | | | | |
| Blue Creek-downstream | | | | | | | | | | | | | | | | | | | |

Table 46. Sites in the upper Kootenai River drainage.

| Sample Site | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | $NO_3$ | $SO_4$ | Si | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nancy Jane-seep | | | | | | | | | | | | | | | | | | | |
| Twin Peaks-seep | | | | | | | | | | | | | | | | | | | |
| Rock Lake-adit | | | | | | | | | | | | | | | | | | | |
| Independence-adit | | | | | | C | | | | | | | | | | | | | |
| Independence-spring | | | | | | | | | | | | | | | | | | | |
| Snowshoe-spring | | | | | | | | | | | | | A C | | | | | | |
| Snowshoe-upstream | | | | | | | | | | | | | | | | | | | |
| Snowshoe - downstream | | | | P A C | | | | | | | | | A C | | | | | | |
| Copper Reward-adit | | | | | | | | | | | | | | | | | | | |
| Cherry Creek mill-upstream | | | | | | | | | | | | | | | | | | | |
| Cherry Creek mill-downstream | | | | | | | | | | | | | | | | | | | |
| Lukens etc-upstream | | | | | | | | | | | | | | | | | | | |
| Lukens etc-downstream | | | | | | | | C | | | | | | | | | | | |
| Loyal-adit discharge | S C | | | | | | | | | | | | | | | | | | |
| Shaughnessy-adit | | | | | | | | | S | | | | | | | | | | S[1] |
| Grouse Mt-upstream | | | | | | | | | | | | | | | | | | | |
| Grouse Mt-downstream | | | | C | | | | | | | | | AC | | | | | | |
| Iron Mask-downstream | P | | | | | | | | | | | | | | | | | | |
| Giant Sunrise-adit | | | | | | | | | | | | | | | | | | | S[1] |
| Giant Sunrise-downstr | | | | | | | | C | | | | | | | | | | | S[1] |
| Sunrise mill-downstr | | | | | | | S | | | | | | | | | | | | |
| Goat Creek-upstream | | | | | | | | | | | | | | | | | | | S[1] |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Goat Ck-downstream | | | | | | | | | | | | | | | | | | | |
| Snowstorm-upstream | | | | | | | | | | | | | | | | | | | S |
| Snowstorm-downstr | | | | | | | | | | | | | | | | | | | S[1] |
| Snowstorm-adit | | | | | | | | | | | | | | | | | | | |

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Appendix I
USFS-MBMG Field Form

## PART A

*(To be completed for all identified sites)*

### LOCATION AND IDENTIFICATION

ID# ____________________ Site Name(s) ______________________________
FS Tract # ____________________________ FS Watershed Code ____________________
Forest ________________________ District ________________________
Location based on: GPS___ Field Map___ Existing Info___ Other______________
Lat______________ Long______________ xutm__________ yutm__________ zutm__________
Quad Name ____________________________ Principal Meridan ____________________
Township ____________ Range ____________ Section ______ ¼______ ¼______ ¼______
State ______ County ______________________ Mining District ____________________

Ownership of *all* disturbances:

______ National Forest (NF)
______ Mixed private and National Forest (or unknown)
______ Private.
*If private only*, impacts from the site on National Forest Resources are
____Visually apparent ____Likely to be significant ____Unlikely or minimal

**If all disturbances are private <u>and</u> impacts to National Forest Resources are unlikely or minimal - STOP**

---

## PART B

*(To be completed for all sites on or likely effecting National Forest lands)*

### SCREENING CRITERIA

| Yes | No | |
|---|---|---|
| ______ | ______ | 1. Mill site or Tailings present |
| ______ | ______ | 2. Adits with discharge or evidence of a discharge |
| ______ | ______ | 3. Evidence of or strong likelihood for metal leaching, or AMD (water stains, stressed or lack of vegetation, waste below water table, etc.) |
| ______ | ______ | 4. Mine waste in floodplain or shows signs of water erosion |
| ______ | ______ | 5. Residences, high public use area, or environmentally sensitive area (as listed in HRS) within 200 feet of disturbance |
| ______ | ______ | 6. Hazardous wastes/materials (chemical containers, explosives, etc) |
| ______ | ______ | 7. Open adits/shafts, highwalls, or hazardous structures/debris |
| ______ | ______ | 8. Site visit *(If yes, take picture of site)*, Film number(s) __________ |

*If yes*, provide name of person who visited site and date of visit
Name: ______________________________ Date: ____________
*If no*, list source(s) of information (If based on personal knowledge, provide name of person interviewed and date):

________________________________________________

**If the answers to questions 1 through 6 are <u>all</u> No - STOP**

---

# PART C

*(To be completed for all sites not screened out in Parts A or B)*

Investigator ______________________________ Date

Weather ______________________________

## 1. GENERAL SITE INFORMATION

*Take panoromic picture(s) of site*, Film Number(s) __________

Size of disturbed area(s) __________acres    Average Elevation __________feet

Access: _____No trail  _____Trail  _____4wd only  _____Improved road
_____Paved road

Name of nearest town (by road): ____________________

Site/Local Terrain: _____Rolling or flat  _____Foothills  _____Mesa  _____Mountains
_____Steep/narrow canyon

Local undisturbed vegetation (*Check all that apply*): _____Barren or sparsely vegetated
_____weeds/grasses _____Brush _____Riparian/marsh _____Deciduous trees
_____Pine/spruce/fir

Nearest wetland/bog: ____On site, ____0-200 feet, ____200 feet - 2 miles, ____> 2 miles

Acid Producers or Indicator Minerals: ____Arsenopyrite, ____Chalcopyrite, ____Galena,
____Iron Oxide, ____Limonite, ____Marcasite, ____Pyrite, ____Pyrrhotite,
____Sphalerite, ____Other Sulfide

Neutralizing Host Rock: ____Dolomite, ____Limestone, ____Marble, ____Other Carbonate

## 2. OPERATIONAL HISTORY

Dates of significant mining activity______________________________

MINE PRODUCTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Commodity(s) | | | | | | | |
| Production (ounces) | | | | | | | |

Years that Mill Operated______________________________

Mill Process: ____Amalgamation, ____Arrastre, ____CIP (Carbon-in-Pulp), ____Crusher only,
____Cyanidation, ____Flotation, ____Gravity, ____Heap Leach, ____Jig Plant,
____Leach, ____Retort, ____Stamp, ____ No Mill, ____Unknown

MILL PRODUCTION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Commodity(s) | | | | | | | |
| Production (ounces) | | | | | | | |

## 3. HYDROLOGY

Name of nearest Stream ________________ which flows into ________________
Springs (*in and around mine site*): ____ Numerous ____ Several ____ None
Depth to Groundwater ______ ft, Measured at: ____shaft/pit/hole ____well ____wetland
Any waste(s) in contact with active stream ____Yes ____No

## 4. TARGETS (*Answer the following based on general observations only*)

Surface Water
Nearest surface water inake ________miles, Probable use ________________
Describe number and uses of surface water intakes observed for 15 miles downstream of site: ________________

________________

________________

Wells
Nearest well ______miles, Probable use ________________
Describe number and use of wells observed within 4 miles of site:

________________

________________

________________

Population
Nearest dwelling ______miles, Number of months/year occupied ______ months
Estimate number of houses within 2 miles of the site (*Provide estimates for 0-200ft, 200ft-1mile, 1-2miles, if possible*)

________________

________________

________________

Recreational Usage
Recreational use on site: ____High (*Visitors observed or evidence such as tire tracks, trash, graffiti, fire rings, etc.; and good access to site*), ____Moderate (*Some evidence of visitors and site is accessible from a poor road or trail*), ____Low (*Little, if any, evidence of visitors and site is not easily accessible)*
Nearest recreational area ______miles, Name or type of area: ________________

## 5. SAFETY RISKS

______Open adit/shaft, ______Highwall or unstable slopes, ______Unstable structures, ______Chemicals, ______Solid waste including sharp rusted items, ______Explosives

## 6. MINE OPENINGS

*Include in the following chart all mine openings located on or partially on National Forest lands. Also, include mine openings located entirely on private land if a point discharge from the opening crosses onto National Forest land. In this case, enter data for the point at which the discharge flows onto National Forest land; you do not need to enter information about the opening itself.*

TABLE 1 - ADITS, SHAFTS, PITS, AND OTHER OPENINGS

| | | | | | | |
|---|---|---|---|---|---|---|
| Opening Number | | | | | | |
| Type of Opening | | | | | | |
| Ownership | | | | | | |
| Opening Length (ft) | | | | | | |
| Opening Width (ft) | | | | | | |
| Latitude (GPS) | | | | | | |
| Longitude (GPS) | | | | | | |
| Condition | | | | | | |
| Ground water | | | | | | |
| Water Sample # | | | | | | |
| Photo Number | | | | | | |

Comments *(When commenting on a specfic mine opening, reference opening number used in Table 1)*:

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

**Codes Applicable for all entries:** NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Type of opening**: ADIT=Adit, SHAFT=Shaft, PIT=Open Pit/Trench, HOLE=Prospect Hole, WELL=Well

**Ownership**: NF=National Forest, MIX=National Forest and Private (Also, for unknown), PRV=Private

**Condition** *(Enter all that apply)*: INTACT=Intact, PART=Partially collapsed or filled, COLP=Filled or collapsed, SEAL=Adit plug, GATE=Gated barrier,

**Ground water** (*Water or evidence of water discharging from opening*): NO=No water or indicators of water, FLOW=Water flowing, INTER=Indicators of intermittant flow, STAND= Standing water only (*In this case, enter an estimate of depth below grade*)

## 7. MINE/MILL WASTE

*Include in the following chart all mine/mill wastes located on or partially on National Forest lands. Also, include mine/mill wastes located entirely on private land if is visually effecting or is very likely to be effecting National Forest resources. In this case enter data for the point at which a discharge from the waste flows onto National Forest land, or where wastes has migrated onto National Forest land; only enter as much information about the waste as relevant and practicable.*

TABLE 2 - DUMPS, TAILINGS, AND SPOIL PILES

| | | | | | | |
|---|---|---|---|---|---|---|
| Waste Number | | | | | | |
| Waste Type | | | | | | |
| Ownership | | | | | | |
| Area (acres) | | | | | | |
| Volume (cu yds) | | | | | | |
| Size of Material | | | | | | |
| Wind Erosion | | | | | | |
| Vegetation | | | | | | |
| Surface Drainage | | | | | | |
| Indicators of Metals | | | | | | |
| Stability | | | | | | |
| Location with respect to Floodplain | | | | | | |
| Distance to Stream | | | | | | |
| Water Sample # | | | | | | |
| Waste Sample # | | | | | | |
| Soil Sample # | | | | | | |
| Photo Number | | | | | | |

**Codes Applicable for all entries**: NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Waste Type**: WASTE=Waste rock dump, MILL=Mill tailings, SPOIL=Overburden or spoil pile, HIGH=Highwall, PLACER=Placer or hydraulic deposit, POND=Settling pond or lagoon, ORE=Ore Stockpile, HEAP=Heap Leach

**Ownership**: NF=National Forest, MIX=National Forest and Private (*Also, for unknown*), PRV=Private

**Size of material** (*If composed of different size fractions, enter the sizes that are present in significant amounts*): FINE=Finer than sand, SAND=sand, GRAVEL=>sand and <2", COBBLE=2"-6", BOULD=>6"

**Wind Erosion**, Potential for: HIGH=Fine, dry material that could easily become airborne, airborne dust, or windblown deposits, MOD=Moderate, Some fine material, or fine material that is usually wet or partially cemented; LOW=Little if any fines, or fines that are wet year-round or well cemented.

**Vegetation** (*density on waste*): DENSE=Ground cover > 75%, MOD=Ground cover 25% - 75%, SPARSE=Ground cover < 25%, BARREN=Barren

**Surface Drainage** (*Include all that apply*): RILL=Surface flow channels mostly < 1' deep, GULLY=Flow channels >1' deep, SEEP=Intermittant or continuous discharge from waste deposit, POND=Seasonsal or permanent ponds on feature, BREACH=Breached, NO=No indicators of surface flow observe

**Indicators of Metals** (*Enter as many as exist*): NO=None, VEG=Absence of or stressed vegetation, STAIN=yellow, orange, or red precipitate, SALT=Salt deposits, SULF=Sulfides present

**Stability**: EMER=Imminent mass failure, LIKE=Potential for mass failure, LOW=mass failure unlikely

**Location w/respect to Stream**: IN=In contact with normal stream, NEAR=In riparian zone or floodplain, OUT=Out of floodplain

## 8. SAMPLES

*Take samples only on National Forest lands.*

TABLE 3 - WATER SAMPLES FROM MINE SITE DISCHARGES

| | | | | | | |
|---|---|---|---|---|---|---|
| Sample Number | | | | | | |
| Date sample taken | | | | | | |
| Sampler (*Initials*) | | | | | | |
| Discharging From | | | | | | |
| Feature Number | | | | | | |
| Indicators of Metal Release | | | | | | |
| Indicators of Sedimentation | | | | | | |
| Distance to stream (ft) | | | | | | |
| Sample Latitude | | | | | | |
| Sample Longitude | | | | | | |
| Field pH | | | | | | |
| Field SC | | | | | | |
| Flow (*gpm*) | | | | | | |
| Method of measurement | | | | | | |
| Photo Number | | | | | | |

Comments: (*When commenting on a specfic water sample, reference sample number used in Table 3*):

________________________________________

________________________________________

________________________________________

________________________________________

**Codes Applicable for all entries:** NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Discharging From:** ADIT=Adit, SHAFT=Shaft, PIT=Pit/Trench, HOLE=Prospect Hole, WASTE=Waste rock dump, MILL=Mill tailings, SPOIL=Overburden or spoil pile, HIGH=Highwall, PLACER=Placer or hydraulic deposit, POND=Settling pond or lagoon, WELL=Well

**Feature Number:** Corresponding number from Table 1 or Table 2 (*Opening Number or Waste Number*)

**Indicators of Metal Release** (*Enter as many as exist*): NO=None, VEG=Absence of, or stressed vegetation/ organisms in and along drainage path, STAIN=yellow, orange, or red precipitate, SALT= Salt deposits, SULF=Sulfides present, TURB=Discolored or turbid discharge

**Indicators of Sedimentation** (*Enter as many as exist*): NO=None, SLIGHT=Some sedimentation in channel, banks and channel largely intact, MOD=Sediment deposits in channel, affecting flow patterns, banks largely intact, SIGN=Sediment deposits in channel and/or along stream banks extending to nearest stream

**Method of Measurement:** EST=Estimate, BUCK=Bucket and time, METER=Flow meter

## TABLE 4 - WATER SAMPLES FROM STREAM(S)

| Location relative to mine site/features | Upstream (Background) | Downstream | | |
|---|---|---|---|---|
| Sample Number | | | | |
| Date sample taken | | | | |
| Sampler (Initials) | | | | |
| Stream Name | | | | |
| Indicators of Metal Release | | | | |
| Indicators of Sedimentation | | | | |
| Sample Latitude | | | | |
| Sample Longitude | | | | |
| Field pH | | | | |
| Field SC | | | | |
| Flow (gpm) | | | | |
| Method of measurement | | | | |
| Photo Number | | | | |

Comments: (*When commenting on a specfic water sample, reference sample number used in Table 4*):

______________________________________________

______________________________________________

______________________________________________

______________________________________________

**Codes Applicable for all entries**: NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Indicators of Metal Release** (*Enter as many as exist*): NO=None, VEG=Absence of, or stressed streamside vegetation/organisms in and along drainage path, STAIN=yellow, orange, or red precipitate, SALT=Salt deposits, SULF=Sulfides present, TURB=Discolored or turbid discharge

**Indicators of Sedimentation** (*Enter as many as exist*): NO=None, SLIGHT=Some sedimentation in channel, natural banks and channel largely intact, MOD=Sediment deposits in channel, affecting stream flow patterns, natural banks largely intact, SIGN=Sediment deposits in channel and/or along stream banks extending ½ a mile or more downstream

**Method of Measurement:** EST=Estimate, BUCK=Bucket and time, METER=Flow meter

## TABLE 5 - WASTE SAMPLES

| | | | | |
|---|---|---|---|---|
| Sample Number | | | | |
| Date of sample | | | | |
| Sampler (*Initials*) | | | | |
| Sample Type | | | | |
| Waste Type | | | | |
| Feature Number | | | | |
| Sample Latitude | | | | |
| Sample Longitude | | | | |
| Photo Number | | | | |

Comments: (*When commenting on a specfic waste or soil sample, reference sample number used in Table 5*):

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

**Codes Applicable for all entries**: NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Sample Type:** SING=Single sample, COMP=composite sample (enter length)

**Waste Type:** WASTE=Waste rock dump, MILL=Mill tailings, SPOIL=Overburden or spoil pile, HIGH=Highwall, PLACER=Placer or hydraulic deposit, POND=Settling pond or lagoon sludge, ORE=Ore Stockpile, HEAP=Heap Leach

**Feature Number**: Corresponding number from Table 2 (*Waste Number*)

## TABLE 6 - SOIL SAMPLES

| | | | | |
|---|---|---|---|---|
| Sample Number | | | | |
| Date of sample | | | | |
| Sampler (*Initials*) | | | | |
| Sample Type | | | | |
| Sample Latitude | | | | |
| Sample Longitude | | | | |
| Likely Source of Contamination | | | | |
| Feature Number | | | | |
| Indicators of Contamination | | | | |
| Photo Number | | | | |

Comments: (*When commenting on a specfic waste or soil sample, reference sample number used in Table 6*):

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

**Codes Applicable for all entries**: NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Sample Type**: SING=Single sample, COMP=composite sample (enter length)

**Likely Source of Contamination**: ADIT=Adit, SHAFT=Shaft, PIT=Open Pit, HOLE=Prospect Hole, WASTE=Waste rock dump, MILL=Mill tailings, SPOIL=Overburden or spoil pile, PLACER=Placer or hydraulic deposit, POND=Settling pond or lagoon, ORE=Ore Stockpile, HEAP=Heap Leach

**Feature Number**: Corresponding number from Table 1 or 2 (*Opening or Waste Number*)

**Indicators of Contamination** (*Enter as many as exist*): NO=None, VEG=Absence of vegetation, PATH=Visible sediment path, COLOR=Different color of soil than surrounding soil, SALT=Salt crystals

## 9. HAZARDOUS WASTES/MATERIALS

TABLE 7 - HAZARDOUS WASTES/MATERIALS

| | | | | |
|---|---|---|---|---|
| Waste Number | | | | |
| Type of Containment | | | | |
| Condition of Containment | | | | |
| Contents | | | | |
| Estimated Quantity of Waste | | | | |

Comments: *(When commenting on a specfic hazardous waste or site condition, reference waste number used in Table 7)*:

**Codes Applicable for all entries**: NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Type of Containment**: NO=None, LID=drum/barrel/vat with lid, AIR=drum/barrel/vat without lid, CAN=cans/jars, LINE=lined impoundment, EARTH=unlined impoundment

**Condition of Containment**: GOOD=Container in good condition, leaks unlikely, FAIR=Container has some signs of rust, cracks, damage but looks sound, leaks possible, POOR=Container has visible holes, cracks or damage, leaks likely, BAD=Pieces of containers on site, could not contain waste

**Contents**: from label if available, or guess the type of waste, e.g., petroleum product, solvent, processing chemical.

**Estimated Quantity of Waste**: Quantity still contained and quantity released

## 10. STRUCTURES

*For structures on or partially on National Forest lands.*

TABLE 8 - STRUCTURES

| | | | | | | |
|---|---|---|---|---|---|---|
| Type | | | | | | |
| Number | | | | | | |
| Condition | | | | | | |
| Photo Number | | | | | | |

Comments:

______________________________________________

______________________________________________

______________________________________________

**Codes Applicable for all entries:** NA= Not applicable, UNK=Unknown, OTHER=Explain in comments, NO=NO or none

**Type:** CABIN=Cabin or community service (*store, church, etc.*), MILL=mill building, MINE=building related to mine operation, STOR=storage shed, FLUME=Ore Chute/flume or tracks for ore transport

**Number:** Number of particular type of structure all in similar condition or length in feet

**Condition:** GOOD=all components of structure intact and appears stable, FAIR=most components present but signs of deterioration, POOR=major component (*roof, wall, etc*) of structure has collapsed or is on the verge of collapsing, BAD=more than half of the structure has collapsed

## 11. MISCELLANEOUS

Are any of the following present? (Check all that apply): ______Acrid Odor, ______Drums, ______Pipe, ______Poles, ______Scrap Metal, ______Overhead wires, ______Overhead cables, ______Headframes, ______Wooden Structures, ______Towers, ______Power Substations, ______Antennae, ______Trestles, ______Powerlines, ______Transformers, ______Tramways, ______Flumes, ______Tram Buckets, ______Fences, ______Machinery, ______Garbage

Describe any obvious removal actions that are needed at this site:

______________________________________________

______________________________________________

______________________________________________

______________________________________________

General Comments/Observations (not otherwise covered)

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

______________________________________________

## 12. SITE MAP

Prepare a sketch of the site. Indicate all pertinent features of the site and nearby environment. Include all significant mine and surface water features, access roads, structures, etc. Number each important fearue at the mine site and use these number throughout this form when referring to a particular feature (Tables 1 and 2). Sketch the drainage routes off the site into the nearest stream.

## 13. RECORDED INFORMATION

**Owner(s) of patented land**
Name: ____________________
Address: ____________________
Telephone Number: ____________________

**Claimant(s)**
Name: ____________________
Address: ____________________
Telephone Number: ____________________

**Surface Water** (*From water rights*)
Number of Surface Water Intakes within 15 miles downstream of site used for:
_____Domestic, _____Municipal, _____Irrigation, _____Stock, _____Commerical/Industrial, _____Fish Pond, _____Mining, _____Recreation, _____Other

**Wells** (*From well logs*)
Nearest well _____miles
Number of wells within _____0-¼ miles _____¼-½ miles _____½-1 mile _____1-2 miles _____2-3 miles _____3-4 miles of site

**Sensitive Environments**
List any sensitive environments (as listed in the HRS) within 2 miles of the site or along receiving stream for 15 miles downstream of site (*wetlands, wilderness, national/state park, wildlife refuge, wild and scenic river, T&E or T&E habitat, etc*):

____________________
____________________
____________________

**Population** (*From census data*)
Population within _____0-¼ miles _____¼-½ miles _____½-1 mile _____1-2 miles _____2-3 miles _____3-4 miles of site

**Public Interest**
Level of Public Interest: _____Low, _____Medium, _____High
Is the site under regulatory or legal action? _____Yes, _____No

Other sources of information (MILs #, MRDS #, other sampling data, etc):

____________________
____________________
____________________
____________________
____________________

# Appendix II
List of Sites in the Kootenai National Forest

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | ADA PROSPECT | 30W | 31N | 21 | AACC | VERMICULITE MOUNTAIN |
| V | ADIT (GOAT CREEK) | 34W | 31N | 31 | BDCD | SMITH MOUNTAIN |
| V | AJAX PLACER / SEE ALSO WALNUT | 30W | 24N | 9 | BBBB | SEVEN POINT MOUNTAIN |
| V | AMAZON PROPERTY | 34W | 27N | 25 | ABDB | HERON |
| V | AMBASSADOR | 32W | 23N | 4 | DDDB | LARCHWOOD |
| V | AMERICAN EAGLE/FEDERAL SILVER LEAD | 34W | 31N | 34 | ABBD | TROY |
| V | AMERICAN KOOTENAI | 31W | 27N | 36 | CCBA | HOWARD LAKE |
| S | ASARCO TAILINGS POND | 33W | 30N | 31 | DAAB | CROWELL MOUNTAIN |
| S | ATTLEBURY CREEK MINE SHAFT | 32W | 23N | 1 | CDDC | BLOOM PEAK |
| S | BARITE PROSPECT | 34W | 30N | 12 | | TROY |
| S | BEAR | 34W | 31N | 16 | | TROY |
| U | BEAR CREEK PORTAL | 31W | 28N | 30 | | SNOWSHOE PEAK |
| S | BEE AND BOO CLAIM GROUP | 34W | 27N | 12 | | HERON |
| S | BEE AND ZEE | 32W | 31N | 29 | | SCENERY MOUNTAIN |
| S | BETTY MAE | 31W | 27N | 27 | | HOWARD LAKE |
| S | BIG CHANCE PLACER | 27W | 29N | 18 | | WOLF PRAIRIE |
| S | BIG CHERRY CREEK PLACER | 31W | 29N | 33 | | CABLE MOUNTAIN |
| V | BIG CREEK | 30W | 35N | 28 | DCDA | BOULDER LAKES |
| U | BIG CREEK EXTENSION | 30W | 35N | 27 | | BOULDER LAKES |
| V | BIG EIGHT / B & B / B + B | 34W | 31N | 19 | ADDB | TROY |
| S | BIG EIGHT PLACER | 28W | 29N | 24 | | WOLF PRAIRIE |
| U | BIG FOUR | 34W | 31N | 18 | | TROY |
| V | BIG SKY / MONTANA SILVER-LEAD | 32W | 29N | 36 | CCCD | SNOWSHOE PEAK |
| S | BIMETALLIC / BLACK HORSE | 34W | 30N | 14 | | SPAR LAKE |
| V | BLACK DIAMOND | 34W | 33N | 3 | AAAA | NEWTON MOUNTAIN |
| U | BLACKTAIL | 34W | 31N | 17 | | TROY |
| V | BLUE CREEK / SCOTCHMAN / NORTH STAR | 34W | 27N | 3 | CCDA | SAWTOOTH MOUNTAIN |
| V | BLUEBIRD - SEE ALSO GREEN MOUNTAIN | 26W | 37N | 24 | CCCD | KSANKA PEAK |
| S | BOLYARD PLACER /VAUGHAN & GREENWELL | 31W | 27N | 12 | CBDB | HOWARD LAKE |
| S | BONANZA GOLD MINE | 30W | 24N | 6 | | SEVEN POINT MOUNTAIN |
| S | BONNETT-HOERNER | 26W | 35N | 6 | | EUREKA SOUTH |
| S | BONUS CLAIM | 32W | 34N | 34 | | FLATIRON MOUNTAIN |
| S | BOULDER HILL (HOPE & BOULDER HILL) | 27W | 29N | 15 | B | WOLF PRAIRIE |
| V | BRAMLET CREEK MILL | 31W | 26N | 1 | ACAC | HOWARD LAKE |
| V | BRANAGAN / BRANNIGAN / FISHER CREEK | 31W | 26N | 1 | DBBA | HOWARD LAKE |
| S | BRENDE PROPERTY | 31W | 25N | 26 | DADA | GOAT PEAK |
| V | BROWN HILL / BROKEN HILL / BOBBY | 34W | 27N | 10 | ACBC | HERON |
| U | CABINET | 34W | 31N | 19 | | TROY |
| V | CABINET QUEEN PROSPECT | 34W | 30N | 10 | DDBB | SPAR LAKE |
| S | CABLEWAY GROUP | 31W | 28N | 33 | | SNOWSHOE PEAK |
| S | CALLAHAN CREEK PLACER | 34W | 31N | 23 | | TROY |
| V | CHERRY CREEK MILL SITE | 31W | 29N | 27 | CADA | CABLE MOUNTAIN |
| S | CHINA CREEK | 32W | 31N | 6 | | SCENERY MOUNTAIN |
| S | CHRISTMAS TREE MINE | 34W | 31N | 16 | | TROY |
| S | CLARK FORK PLACER | 31W | 24N | 7 | | TROUT CREEK |
| S | COMET PLACER | 31W | 28N | 24 | A | CABLE MOUNTAIN |
| S | CONDOR MINING & LEASING | 34W | 31N | 22 | | TROY |
| S | COPELAND | 30W | 34N | 5 | | PINK MOUNTAIN |
| S | COPPER MOUNTAIN | 31W | 30N | 12 | | LIBBY |
| S | COPPER MOUNTAIN MINE | 34W | 30N | 12 | | TROY |
| V | COPPER REWARD / WALKER GROUP | 31W | 28N | 8 | CDDA | SNOWSHOE PEAK |
| V | COPPER RIDGE | 31W | 25N | 26 | DADA | GOAT PEAK |
| V | COPPER RIDGE MILL | 31W | 25N | 25 | CCDB | GOAT PEAK |

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | COPPER-IRON OCCURRENCE | 30W | 28N | 15 | | HORSE MOUNTAIN |
| S | COPPER-LEAD-IRON-MANGANESE OCCUR. | 30W | 28N | 35 | | HORSE MOUNTAIN |
| S | COPPER-SILVER-IRON OCCURRENCE | 31W | 31N | 36 | | LIBBY |
| S | COW CREEK | 28W | 28N | 6 | | FISHER MOUNTAIN |
| S | CRATER | 33W | 31N | 26 | | KOOTENAI FALLS |
| U | CRESCENT TUNNEL | 34W | 30N | 2 | | TROY |
| V | D. & W. GROUP IDA V. ADIT | 31W | 30N | 32 | | LITTLE HOODOO MTN |
| | DANIEL LEE / DANIEL LEE VEIN | 34W | 29N | 26 | | SAWTOOTH MOUNTAIN |
| S | DARLING PLACER | 27W | 29N | 21 | | WOLF PRAIRIE |
| U | DENVER NO. 1 & 2 | 31W | 30N | 29 | | LITTLE HOODOO MTN |
| | DIAMOND JOHN | 31W | 27N | 16 | | HOWARD LAKE |
| S | DOME MINE | 32W | 30N | 16 | | TREASURE MOUNTAIN |
| V | DOUBLE MAC | 32W | 29N | 12 | AADA | LITTLE HOODOO MTN |
| S | DUPLEX / SUGAR QUEEN | 34W | 33N | 29 | DBBC | LEONIA |
| S | ESTHER MAY ASBESTOS | 32W | 36N | 34 | | YAAK |
| U | FAIRBAULT | 31W | 28N | 19 | | SNOWSHOE PEAK |
| S | FAIRWAY CREEK PROSPECT | 34W | 29N | 10 | | SPAR LAKE |
| U | FERREL | 33W | 33N | 9 | | NEWTON MOUNTAIN |
| S | FISHER RIVER PROPERTY | 29W | 25N | 2 | | MILLER LAKE |
| S | FISHER RIVER QUARRY | 31W | 30N | 3 | | LIBBY |
| S | FORD PLACER | 30W | 27N | 19 | | HOWARD LAKE |
| S | FOUR UP GROUP | 32W | 24N | 22 | | LARCHWOOD |
| S | FOURTH OF JULY | 31W | 26N | 13 | DCBB | HOWARD LAKE |
| S | FREDERICK AND WIND GROUP | 34W | 27N | 15 | | HERON |
| S | FREEMAN PROSPECT | 32W | 27N | 26 | | ELEPHANT PEAK |
| S | GETNER PLACER | 30W | 28N | 5 | | HORSE MOUNTAIN |
| V | GIANT SUNRISE / MONTANA SUNRISE | 34W | 30N | 11 | BBBC | TROY |
| V | GILBRALTER RIDGE MINE | 25W | 36N | 32 | ABDB | MOUNT MARSTON |
| V | GLACIER AG-PB /HAZEL T./ LUKENS | 31W | 29N | 5 | CABB | LITTLE HOODOO MTN |
| V | GLORIA | 31W | 27N | 34 | CDDB | HOWARD LAKE |
| S | GOLD FLINT-KEY STONE | 33W | 34N | 16 | CBBB | NEWTON MOUNTAIN |
| S | GOLD HILL GROUP, GOLD HILL CLAIMS | 30W | 25N | 4 | | SILVER BUTTE PASS |
| V | GOLD KING PROSPECT | 30W | 24N | 4 | ABCA | SEVEN POINT MOUNTAIN |
| S | GOLDEN BEAR | 32W | 30N | 17 | | TREASURE MOUNTAIN |
| S | GOLDEN ROC MINES | 32W | 23N | 15 | | BLACK PEAK |
| V | GOLDEN WEST MINE, "NEW" MINE | 31W | 27N | 34 | DBAA | HOWARD LAKE |
| V | GOPHER HOLE MINE | 34W | 27N | 10 | CDBB | HERON |
| S | GRANITE CONCRETE PIT AND PLANT | 31W | 30N | 12 | | LIBBY |
| V | GRANITE CREEK / MOUNTAIN ROSE | 31W | 29N | 7 | BDBC | LITTLE HOODOO MTN |
| U | GREAT NORTHERN PROPERTY | 34W | 30N | 10 | | TROY |
| V | GREEN MOUNTAIN | 26W | 37N | 24 | BBCC | KSANKA PEAK |
| U | GRIZZLY / MISSOURI GROUP | 31W | 28N | 4 | BBBA | CABLE MOUNTAIN |
| V | GROUSE CREEK | 34W | 30N | 24 | BAAC | SPAR LAKE |
| V | GROUSE MOUNTAIN | 34W | 30N | 10 | CABA | TROY |
| S | HALFMOON | 31W | 28N | 33 | | CABLE MOUNTAIN |
| V | HANNEGAN / LIBBY | 31W | 26N | 2 | ABCD | HOWARD LAKE |
| V | HANSEN PROSPECT / LITTLE PRINCESS? | 26W | 37N | 8 | AABA | EUREKA NORTH |
| S | HARRY HOWARD PLACER | 31W | 29N | 34 | | CABLE MOUNTAIN |
| V | HATHAWAY | 29W | 30N | 7 | CCDD | TONY PEAK |
| V | HEIDELBERG MINE / PRICE CLAIMS | 31W | 27N | 32 | CBCA | ELEPHANT PEAK |
| S | HEINTZ R A CONSTRUCTION | 31W | 30N | 3 | | LIBBY |
| V | HERBERT GROUP | 31W | 30N | 29 | DCCD | LITTLE HOODOO MTN |
| V | HIAWATHA | 34W | 30N | 10 | DADB | TROY |

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | HOERNER | 33W | 35N | 3 | | CLARK MOUNTAIN |
| V | HOLLIDAY (HOMESTEAD / SILVER MARK) | 34W | 26N | 36 | AADD | GEM PEAK |
| S | HOMESTEAD MINING CLAIMS | 34W | 26N | 36 | AADD | GEM MOUNTAIN |
| S | HORSE HILL | 26W | 30N | 30 | C | HORSE HILL |
| S | HOWARD CREEK CLAIM | 31W | 27N | 13 | | HOWARD LAKE |
| V | HOYT (NORTH STAR GROUP) | 29W | 32N | 26 | DAAD | URAL CREEK |
| S | ILLINOIS-MONTANA GROUP | 31W | 26N | 13 | DCDC | HOWARD LAKE |
| V | INDEPENDENCE | 26W | 37N | 22 | CAAD | KSANKA PEAK |
| S | INDIAN HEAD TUNGSTEN | 32W | 30N | 21 | | TREASURE MOUNTAIN |
| V | IRISH BOY AND RAMBLER | 30W | 26N | 18 | CAAA | HOWARD LAKE |
| V | IRON MASK | 34W | 30N | 14 | BACB | SPAR LAKE |
| S | IRON OCCURRENCE | 29W | 37N | 8 | | ROBINSON MOUNTAIN |
| S | IRON OCCURRENCE | 31W | 31N | 36 | | LIBBY |
| S | IRON OCCURRENCE | 28W | 32N | 7 | D | VOLCOUR |
| S | IRON-COPPER OCCURRENCE | 32W | 32N | 2 | | TURNER MOUNTAIN |
| S | IRON-PHOSPHATE OCCURRENCE | 30W | 31N | 28 | | VERMICULITE MOUNTAIN |
| V | JACK WAITE MINE | 32W | 22N | 17 | DAAC | BLACK PEAK |
| S | JF PROSPECT | 33W | 28N | 7 | DACB | SAWTOOTH MOUNTAIN |
| V | JOHN BULL-UNCLE SAM MINE | 31W | 28N | 22 | CACA | CABLE MOUNTAIN |
| S | JOHN FRANCIS CLAIMS | 34W | 28N | 14 | | SAWTOOTH MOUNTAIN |
| S | JOSEPH PROSPECT | 30W | 31N | 21 | BCDD | VERMICULITE MOUNTAIN |
| V | JUMBO MINE (FORMERLY TIP TOP) | 31W | 26N | 1 | BAAC | HOWARD LAKE |
| U | KEELER MOUNTAIN | 34W | 30N | 25 | | SPAR LAKE |
| S | KENELTY | 29W | 33N | 25 | | URAL CREEK |
| S | KENELTY MINE | 28W | 27N | 34 | | LOON LAKE |
| S | KENNEDY | 30W | 31N | 34 | | VERMICULITE MOUNTAIN |
| V | KING / SILVER BUTTE | 30W | 25N | 7 | DDAA | GOAT PEAK |
| S | KIRKPATRICK | 27W | 29N | 15 | | WOLF PRAIRIE |
| S | KOOTENAI RIVER PLACER | 28W | 33N | 20 | | URAL CREEK |
| S | KOTSCHEVAR BARITE | 34W | 30N | 1 | | TROY |
| S | LARUE-CRIPE ASBESTOS | 32W | 35N | 25 | | YAAK |
| V | LAST CHANCE (LITTLE SPOKANE) | 34W | 30N | 23 | ADDB | SPAR LAKE |
| S | LAST CHANCE GROUP / POSTON GROUP | 30W | 31N | 10 | DABC | VERMICULITE MOUNTAIN |
| U | LAURA APEX GROUP | 29W | 24N | 12 | | VERMILION PEAK |
| U | LEIGH CREEK | 32W | 28N | 6 | | SNOWSHOE PEAK |
| S | LIBBY CREEK GOLD MINING CO. | 31W | 27N | 11 | | HOWARD LAKE |
| S | LIBBY CREEK PLACER | 30W | 28N | 30 | | CABLE MOUNTAIN |
| S | LIBBY PIT | 31W | 31N | 30 | BACA | LIBBY |
| V | LIBBY PROSPECT (SEE HANNEGAN) | 31W | 26N | 2 | | HOWARD LAKE |
| S | LIBBY SAND AND GRAVEL PIT | 31W | 31N | 32 | | LIBBY |
| S | LIBERTY METALS | 34W | 31N | 35 | | TROY |
| S | LIMESTONE OCCURRENCE | 27W | 37N | 12 | | EUREKA NORTH |
| S | LIMESTONE OCCURRENCE | 34W | 33N | 34 | A | KILBRENNAN LAKE |
| S | LIMESTONE OCCURRENCE | 31W | 33N | 8 | | FLATIRON MOUNTAIN |
| S | LITTLE SPOKANE | 34W | 30N | 10 | | TROY |
| V | LOST CAUSE MINE | 34W | 30N | 2 | DBBB | TROY |
| V | LOYAL | 31W | 29N | 6 | ABCC | LITTLE HOODOO MTN |
| V | LUCKY LUKE | 30W | 22N | 18 | DDAB | BELKNAP |
| S | LUCKY MAC GROUP | 30W | 31N | 28 | | VERMICULITE MOUNTAIN |
| V | LUKENS-HAZEL UPPER ADITS | 31W | 29N | 5 | BCCA | LITTLE HOODOO MTN |
| S | LYNX CREEK | 33W | 32N | 26 | | PULPIT MOUNTAIN |
| S | MANGANESE-LEAD-COPPER-IRON OCCUR. | 30W | 37N | 2 | | ROBINSON MOUNTAIN |
| S | MASTODON (BARBARA CLAIMS) KAVALLA | 27W | 29N | 20 | DBAA | WOLF PRAIRIE |

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | MC GUIRE PROSPECT | 29W | 34N | 24 | | INCH MOUNTAIN |
| S | METALLIC MINERALS OCCURRENCE | 30W | 36N | 18 | | MOUNT HENRY |
| V | MIDAS MINE / ROSE CONSOLIDATED | 30W | 27N | 19 | DCDC | HOWARD LAKE |
| U | MILLER | 33W | 26N | 35 | ABAA | NOXON |
| S | MILLER PLACER | 30W | 26N | 4 | DCDA | BARREN PEAK |
| S | MILTON GROUP | 34W | 31N | 13 | | TROY |
| S | MISSOURI (SEE GRIZZLY LN006170) | 31W | 28N | 4 | | CABLE MOUNTAIN |
| U | MOEN | 26W | 37N | 8 | ACBA | EUREKA NORTH |
| S | MONTANA MORNING | 34W | 31N | 28 | DADA | TROY |
| S | MONTANA PLACER | 31W | 28N | 3 | | CABLE MOUNTAIN |
| S | MONTANA PREMIER MINE | 34W | 30N | 12 | | TROY |
| S | MONTANORE ADIT | 31W | 27N | 11 | CCDC | HOWARD LAKE |
| S | MONTANORE PROJECT ADIT & PLANT SITE | 31W | 27N | 9 | CBCA | HOWARD LAKE |
| V | MONTEZUMA / HALLALUJAH | 30W | 27N | 31 | AABC | HOWARD LAKE |
| V | MOUNTAIN ROSE | 31W | 29N | 7 | BDBC | LITTLE HOODOO MTN |
| V | MUSTANG OR NETHERCUTT'S MINE | 31W | 27N | 26 | ACDA | HOWARD LAKE |
| S | NANCY | 29W | 26N | 14 | | KENELTY MOUNTAIN |
| V | NANCY JANE CLAIMS | 26W | 37N | 14 | DBBC | KSANKA PEAK |
| S | NAPOLEON PROSPECT | 30W | 31N | 22 | | VERMICULITE MOUNTAIN |
| V | NEW MORNING GLORY / HAYWIRE MINING | 33W | 34N | 9 | BBAA | NEWTON MOUNTIAN |
| S | NUGGET PLACER | 30W | 29N | 19 | | SWEDE MOUNTAIN |
| S | OLSEN & SWITZER | 31W | 26N | 11 | ABDD | HOWARD LAKE |
| S | ORO-HIGHLAND / HIGHLAND SILVER | 35W | 32N | 36 | D | SMITH MOUNTAIN |
| V | PETERSON (TWIN PEAKS) BLACKTAIL | 26W | 37N | 14 | DDDA | KSANKA PEAK |
| S | PHILLIPS | 31W | 37N | 25 | B | MOUNT HENRY |
| V | PILGRIM | 33W | 25N | 8 | CCDD | GEM MOUNTAIN |
| S | POTTER | 28W | 27N | 20 | CACC | LOON LAKE |
| S | RANKIN | 34W | 32N | 14 | | KILBRENNAN LAKE |
| S | RAVEN | 30W | 31N | 21 | | VERMICULITE MOUNTAIN |
| S | RAZORBACK | 30W | 24N | 15 | | SEVEN POINT MOUNTAIN |
| V | RED FIR CLAIMS | 34W | 27N | 25 | ABDB | HERON |
| S | RED GULCH PLACER | 30W | 28N | 19 | B | CABLE MOUNTAIN |
| S | REMP (SILVER GHOST) | 32W | 30N | 6 | DCAA | SCENERY MOUNTAIN |
| V | REX MINE / JAGER MINE | 25W | 35N | 15 | CBDA | MOUNT MARSTON |
| S | ROCK CREEK PROJECT / COPPER | 32W | 27N | 26 | DCCC | ELEPHANT PEAK |
| V | ROCK LAKE ADITS | 26W | 35N | 6 | DBCB | EUREKA SOUTH |
| S | RUTH V | 32W | 24N | 24 | B | LARCHWOOD |
| S | RYAN | 34W | 27N | 23 | | HERON |
| V | SCHMITZ MINE / JOSHUA ADIT | 25W | 35N | 7 | DBDA | MOUNT MARSTON |
| S | SEATTLE | 31W | 28N | 18 | AABC | SNOWSHOE PEAK |
| V | SECLUSION (A.C. LEWIS) | 30W | 27N | 28 | BCBA | BARREN PEAK |
| S | SECOND CHANCE / MCGUIRE PROPERTY | 29W | 34N | 24 | | INCH MOUNTAIN |
| V | SHAUGHNESSY CREEK ADIT | 31W | 29N | 6 | AABA | LITTLE HOODOO MTN |
| V | SHOESTRING 1 & 2 | 31W | 24N | 13 | BDDA | TROUT CREEK |
| S | SID CLAIM | 32W | 24N | 24 | | LARCHWOOD |
| S | SILVER CABLE (PROSPECT) | 32W | 28N | 36 | | SNOWSHOE PEAK |
| V | SILVER GROUSE | 34W | 30N | 11 | BADA | TROY |
| V | SILVER KING | 34W | 30N | 15 | BDAA | SPAR LAKE |
| V | SILVER MOUNTAIN GROUP | 32W | 29N | 12 | | TREASURE MOUNTAIN |
| V | SILVER STRIKE / MOLYNEAUX | 34W | 30N | 10 | | TROY |
| V | SILVER TIP (G.E. SHAW) | 31W | 28N | 18 | | SNOWSHOE PEAK |
| V | SILVERTIP (G.E. SHAW) | 30W | 26N | 32 | BCCA | HOWARD LAKE |
| S | SILVERTIP GROUP / O. A. HOWARD | 31W | 28N | 7 | DCCB | SNOWSHOE PEAK |

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | SIMS GULCH PLACER | 30W | 25N | 24 | CBAD | SILVER BUTTE PASS |
| S | SIMS PROSPECT | 30W | 25N | 14 | DADA | SILVER BUTTE PASS |
| S | SNIPETOWN PLACER | 33W | 33N | 19 | | KILBRENNAN LAKE |
| V | SNOWFALL PROSPECT | 30W | 25N | 16 | CBAC | SILVER BUTTE PASS |
| V | SNOWSHOE GROUP/SNOWSHOE QUARTZ | 32W | 28N | 7 | BADA | SNOWSHOE PEAK |
| V | SNOWSTORM / B. AND B. | 34W | 31N | 20 | CCBC | TROY |
| S | SOLO JOE | 30W | 37N | 28 | | MOUNT HENRY |
| S | SPAR LAKE / SPAR LAKE COPPER | 34W | 29N | 16 | | SPAR LAKE |
| V | ST PAUL /ZOLLARS/ FERN/FAITH/TOPSY | 32W | 28N | 12 | DDDC | SNOWSHOE PEAK |
| V | ST. ANTHONY | 31W | 31N | 19 | CDDA | LIBBY |
| S | ST. PAUL PASS PROSPECT | 31W | 27N | 19 | CDCC | ELEPHANT PEAK |
| S | STATESMAN | 31W | 27N | 5 | CADB | HOWARD LAKE |
| S | STONEHILL PLACER | 29W | 34N | 2 | | INCH MOUNTAIN |
| S | STRODTBECK | 27W | 29N | 4 | | WOLF PRAIRIE |
| S | SUNRISE | 30W | 25N | 9 | | SILVER BUTTE PASS |
| V | SUNRISE MILL | 34W | 30N | 2 | DABC | TROY |
| V | SWANSEA ROSA LODE CLAIM | 26W | 37N | 14 | CAAB | KSANKA PEAK |
| V | SYLVANITE MILL / KEYSTONE GROUP | 33W | 34N | 9 | BABB | NEWTON MOUNTAIN |
| U | TETRAULT | 26W | 37N | 14 | | KSANKA PEAK |
| V | TEXAS RANGER GROUP | 31W | 28N | 6 | CABA | SNOWSHOE PEAK |
| S | TIDEMAN PLACER | 27W | 29N | 17 | | WOLF PRAIRIE |
| S | TOBACCO RIVER PLACER | 27W | 36N | 23 | | EUREKA SOUTH |
| S | TRIO | 33W | 29N | 30 | | CROWELL MOUNTAIN |
| S | TROUT CREEK PLACER | 32W | 24N | 28 | | LARCHWOOD |
| S | TROY PROJ - MAN-WAY & CONVEYOR ADIT | 34W | 29N | 26 | DDBB | SAWTOOTH MOUNTAIN |
| S | TROY PROJ. - NORTH ADITS | 34W | 29N | 35 | ABDA | SAWTOOTH MOUNTAIN |
| S | TROY PROJ. - SOUTH ADIT | 33W | 28N | 6 | ACDD | SAWTOOTH MOUNTAIN |
| S | TROY PROJECT/ SPAR LAKE | 34W | 29N | 25 | BBCD | SAWTOOTH MOUNTAIN |
| S | TWIN PEAKS PROSPECT | 26W | 37N | 8 | | EUREKA NORTH |
| S | ULLEY (SQUAW PEAK) | 34W | 27N | 13 | | HERON |
| V | UNION GROUP - ISMORE/EVENING/ | 31W | 26N | 2 | ACAC | HOWARD LAKE |
| V | UNIVERSAL | 34W | 30N | 11 | CBCC | SPAR LAKE |
| S | UNIVERSAL ZONOLITE CORP. PROPERTY | 30W | 31N | 22 | | VERMICULITE MOUNTAIN |
| S | UNNAMED ALUMINUM | 32W | 34N | 11 | | FLATIRON MOUNTAIN |
| S | UNNAMED ASBESTOS | 30W | 31N | 15 | DDCB | VERMICULITE MOUNTAIN |
| S | UNNAMED BARITE | 28W | 27N | 34 | | LOON LAKE |
| S | UNNAMED BARIUM | 26W | 37N | 13 | | KSANKA PEAK |
| S | UNNAMED BARIUM | 26W | 37N | 25 | | KSANKA PEAK |
| S | UNNAMED CALCITE | 30W | 30N | 3 | | VERMICULITE MOUNTAIN |
| S | UNNAMED CHLORITE & SERICITE | 30W | 33N | 35 | | BANFIELD MOUNTAIN |
| S | UNNAMED CLAY | 32W | 34N | 11 | | FLATIRON MOUNTAIN |
| S | UNNAMED COPPER | 30W | 28N | 35 | | HORSE MOUNTAIN |
| S | UNNAMED COPPER | 30W | 24N | 1 | | SILVER BUTTE PASS |
| S | UNNAMED COPPER | 30W | 28N | 15 | | HORSE MOUNTAIN |
| S | UNNAMED COPPER | 29W | 29N | 31 | | FISHER MOUNTAIN |
| V | UNNAMED COPPER | 28W | 37N | 20 | BAAC | RED MOUNTAIN |
| S | UNNAMED COPPER | 29W | 31N | 15 | C | ALEXANDER MOUNTAIN |
| S | UNNAMED COPPER, LEAD, & SILVER | 30W | 31N | 21 | | VERMICULITE MOUNTAIN |
| S | UNNAMED FELDSPAR & MICA | 30W | 31N | 33 | | VERMICULITE MOUNTAIN |
| S | UNNAMED GALENA | 28W | 36N | 11 | | REXFORD |
| S | UNNAMED GALENA, COPPER, & SILVER | 29W | 37N | 14 | | RED MOUNTAIN |
| S | UNNAMED GOLD | 33W | 35N | 19 | | MOUNT BALDY |
| S | UNNAMED GOLD | 30W | 28N | 9 | | HORSE MOUNTAIN |

| CODE | MINE NAME | R | T | SEC | TRACT | QUADRANGLE |
|---|---|---|---|---|---|---|
| S | UNNAMED GOLD | 30W | 28N | 16 | | HORSE MOUNTAIN |
| S | UNNAMED GOLD & SILVER | 28W | 26N | 11 | | LOON LAKE |
| S | UNNAMED GOLD & SILVER | 33W | 33N | 31 | | PULPIT MOUNTAIN |
| S | UNNAMED GOLD & SILVER | 27W | 30N | 17 | | WOLF PRAIRIE |
| S | UNNAMED GOLD & SILVER | 28W | 26N | 2 | | LOON LAKE |
| V | UNNAMED GOLD & SILVER | 34W | 35N | 25 | | MOUNT BALDY |
| S | UNNAMED LEAD & ZINC | 33W | 33N | 36 | | PULPIT MOUNTAIN |
| S | UNNAMED LIMESTONE | 34W | 33N | 34 | | KILBRENNAN LAKE |
| S | UNNAMED QUARTZ | 29W | 25N | 12 | | MILLER LAKE |
| S | UNNAMED SILVER | 30W | 36N | 18 | | MOUNT HENRY |
| S | UNNAMED SILVER, GOLD, & COPPER | 28W | 37N | 20 | | RED MOUNTAIN |
| S | UNNAMED SILVER, LEAD & COPPER | 29W | 29N | 31 | | FISHER MOUNTAIN |
| S | UNNAMED TALC | 33W | 32N | 25 | | PULPIT MOUNTAIN |
| U | UNNAMED URANIUM | 34W | 30N | 29 | | SPAR LAKE |
| V | UPPER HEIDELBERG | 31W | 27N | 32 | BDBA | HOWARD LAKE |
| S | VALLEY VIEW CLAIM/ J.B. CLAIM | 28W | 37N | 22 | | REXFORD |
| V | VERMICULITE MOUNTAIN MINE | 30W | 31N | 23 | | VERMICULITE MOUNTAIN |
| V | VERMILION / CARPENTER PROPERTY | 30W | 25N | 22 | BBCB | SILVER BUTTE PASS |
| V | VERMILION MILL SITE | 30W | 25N | 27 | ABCC | SILVER BUTTE PASS |
| V | VERMILION RIVER ADIT | 30W | 24N | 9 | BBAA | SEVEN POINT MOUNTAIN |
| S | VERMILLION CREEK PLACER | 30W | 24N | 7 | | SEVEN POINT MOUNTAIN |
| V | VICTOR-EMPIRE | 32W | 29N | 12 | | TREASURE MOUNTAIN |
| V | VIKING MINE / GOLD HILL CLAIMS | 30W | 25N | 4 | CACD | SILVER BUTTE PASS |
| V | WALNUT-CARL E. PLACER | 30W | 24N | 9 | BBBB | SEVEN POINT MOUNTAIN |
| S | WANLESS LAKE PROSPECT /HAMERMILL | 31W | 26N | 15 | CBDB | HOWARD LAKE |
| U | WAYLETT GROUP / MOOSE HILL / ROYAL | 30W | 27N | 28 | CCAC | BARREN PEAK |
| V | WAYLETT NORTH PROSPECTS | 30W | 27N | 20 | DBDC | BARREN PEAK |
| S | WAYLETT PLACER | 30W | 24N | 4 | | SEVEN POINT MOUNTAIN |
| V | WAYUP MINE / WAY UP | 31W | 27N | 33 | ABCA | HOWARD LAKE |
| U | WEYERHAEUSER | 34W | 31N | 5 | B | TROY |
| V | WHITE STAR (BAKER) | 33W | 25N | 4 | BCCB | NOXON |
| V | WILLIAMS | 31W | 27N | 26 | ADAC | HOWARD LAKE |
| S | WOLF CREEK PLACER | 27W | 29N | 18 | | WOLF PRAIRIE |
| S | WOLLASTONITE VEINS | 30W | 30N | 3 | | VERMICULITE MOUNTAIN |
| S | WOODS MINE | 32W | 34N | 34 | | FLATIRON MOUNTAIN |
| U | YAAK FALLS | 33W | 33N | 4 | | NEWTON MOUNTAIN |
| S | ZONOLITE MINE | 30W | 31N | 10 | | VERMICULITE MOUNTAIN |

V: Visited S: Screen in office U: Location inaccurate

Appendix III

Description of Mines and Mill Sites

**Kootenai National Forest - Lincoln County**

<u>American Eagle</u>

LN005646

This site was visited 07/30/97 and one caved adit (N40°E) was found with hearty vegetation. The site is adjacent to the road. The American Eagle was described in Gibson (1948) an adit 1,300 feet long with several hundred feet of crosscuts. This NW-trending working was associated with a metadiorite sill and the Prichard argillite. There may have been three other adits and one of these may have been the one that the MBMG geologist found. The longest adit was driven along an NW-trending fault in the metadiorite sill.

<u>American Kootenai</u>

LN005922

This lode was discovered in the 1890's according to Johns (1970) and according to Gibson (1948), three adits were driven. One adit was still open at the time of this visit, with the two others caved and nearly obliterated. There is a road to the open adit and there was evidence of camping on the waste dump.

Gibson (1948) states that the American Kootenai is hosted by the Prichard Formation with the ore in bedding plane or crosscutting veins. The veins were irregular thickness with very little pyrite; the sparse original pyrite had been largely oxidized. The total length of workings in all three adits was estimated at 600 feet (Gibson, 1948). No trace of the mill was found (built before 1901) and it may have been destroyed by a snowslide or a fire (Johns, 1970). Few sulfides were reported mainly because of oxidation due to the shallow nature of the deposit. A cable that may be a remnant of the aerial tramway from the Jumbo Group was located to the east of the mine.

<u>ASARCO Tailings Pond</u>

LN008393

This site was screened out because the current operating permit is on private land. No references were found for this site.

<u>B & B</u>

LN004169

There are at least three caved adits along the creek. The dumps spill into the creek but are mostly all washed away. Mineralized Prichard is exposed by recent floods downstream on the river. Four patented claims and two unpatented are north of the Snowstorm mine (Johns, 1970). Gibson (1948) first described this site. Sphalerite was the most abundant ore mineral with lesser amounts of galena, pyrrhotite, chalcopyrite, pyrite, and magnetite (Gibson, 1948). This report goes on to say that between 1912 and 1928 over 6,000 tons of lead-zinc ore were mined. It was idle in 1931.

Barite Prospect
LN004114
This site was screened out because it was a prospect, and it was mislocated. There were not any references found for this site.

Bear
LN006194
The Bear site is located a mile and a half northeast of the Big Eight property (Johns, 1970). Johns (1970) states that there is a quartz vein that contains galena and sphalerite, and samples assayed 20 percent lead and three ounces of silver per ton. The vein is in the Prichard Formation. This site was screened out because it is located on a dry ridgetop and is on state land.

Bee and Zee
LN004402
The Bee & Zee Mine was screened out because, according to USGS Bulletin 1501, it is nothing more than a prospect with no workings. The bulletin also states there are several quartz veins a few inches to two feet wide along shear zones conformable and unconformable with the bedding of the argillite host rock.

Betty Mae
LN006122
This site was screened out because Johns (1960) described the property as consisting of "several shallow cuts and pits", and Gibson (1948) described it as six shallow openings and the location is approximate. The property is behind the Montanore locked gate. Minerals occurring in the quartz veins and veinlets include galena, chalcopyrite, sphalerite, lesser amounts of pyrrhotite, native copper, and melanterite, with oxides cerussite and anglesite. The veins are in the Prichard Formation, and a selected sample contained 10% copper, 20 ounces of silver, and ½- ounce of gold per ton.

Big Chance Placer
LN004149
This site was screened out because it is a placer and the only reference to it is a 1981 MSHA report. Most, if not all, land placered in the area along Wolf Creek is private.

Big Cherry Creek Placer
LN006086
Big Cherry Creek is a tributary of Granite Creek, and placer mining has been reported along Big Cherry Creek. The production has not been sufficiently large and testing has not been done to determine if small pockets of dredged gravel exist (Lyden, 1948).

Big Creek
LN004064
This mine lies approximately 300 feet west of the site of the former USFS Big Creek Cabin on Big Creek. The cabin is no longer present but is marked on the topographic maps. The adit is

uphill on a talus slope to the north of pack trail 150. It had a small seep and some standing water inside the open adit. Johns (1970) reported that the adit was 300 feet long driven along a small quartz vein in the Prichard Formation. Small pieces of iron-stained quartz were found on the dump but the majority of the rock was gray quartzite. The adit was hidden by a grove of trees and had a wooden snow-shed or "roof" over it. The adit trended N15°W and was open for at least 40 feet.

Big Creek Extension
LN004069

This site was described by Johns (1970, p. 121) as "high on the ridge just north of the Big Creek property" but no other location was noted. It was screened out because of this inaccurate location. The general area was visited but no signs of mining activity was noted. The property was reported to have had two short adits driven into a barren quartz vein. This occurrence may have been an extension of the Big Creek fault zone.

Big Eight Placer
LN005902

This site was screened out because it was a placer claim which was mostly, if not all, private. It was located in 1902 and no record of production was noted in MBMG Bulletin 17 (1960), p. 35. The property consists of 160 acres.

Big Four
LN006118

There are seven unpatented claims located on the west side of Gordon Creek and a half mile north of Callahan Creek (Gibson, 1948). It is also two and a half miles south of Kerr Mountain (Johns, 1970). There is an adit that has about 1,000 feet of workings, but the veins rarely reach a thickness of six inches. The adits explore two shear zones in the Snowstorm dike, and the wall rock of the dike is in the Prichard formation (Gibson, 1948). The site was screened out because of the inability to locate the mine.

Big Sky
LN006050

This site is located to the north of the trail to Leigh Lake. Johns (1970) reported two accessible adits but when the site was visited in 1998, one was collapsed and MBMG staff could not find the other one. It is assumed that it is caved and covered by talus. The two adits, 1,200 feet and 700 feet long respectively, were driven along the north-trending Snowshoe Fault. Wallace Formation lies to the west of the fault and Ravalli Formation is to the east of the fault. Galena, sphalerite, pyrite, with minor chalcopyrite, arsenopyrite, and pyrrhotite are found in a quartz, ankerite and calcite gangue (Johns, 1970).

Bimetallic Mine
LN006182

There are 14 unpatented claims located on the north side of the North Fork of Keeler Creek (Gibson, 1948). Gibson also states that the development work done was four short adits were driven. The adits explore the Grouse Mountain dike. A few of the veins are more than eight inches thick, but most of the veins are less then eight inches thick. This site was screened out because it is located on a dry ridgetop.

<u>Black Diamond</u>
LN006142

This site has limited access because of private land to the west. One adit was located on KNF-administered land but it was collapsed. Gibson (1948) reported that this property on Pine Creek explored small veins/shear zones in quartzite associated with dikes. He reported a 100-ton mill had been built in the 1930's. Johns (1959) listed workings as consisting of four adits (one 500-feet long) and a “glory hole” on the hillside. This glory hole was not located during the site visit.

<u>Blacktail</u>
LN005650

According to Johns (1970), the Blacktail mine is located on a tributary of Sanko Creek, and the claim was staked after a fire in 1938. The development work included a short shaft and a ten foot adit. Later, two additional claims were located. An additional eight pits and a 20 foot adit exposed 200 feet of the vein. The Blacktail vein ranges in width form two to ten inches. A sample of the vein assayed at 9.64% copper, 2.80 ounces of silver, and 0.04 ounces of gold per ton. This site was screened out because of the inability to locate the mine.

<u>Bolyard Placer</u>
LN005758

This site was screened out because it was a placer and there were no references listed for Bolyard placer in the MILS database.

<u>Bonnett-Hoerner</u>
LN004049

This occurrence is described in Johns (1961) as a barite prospect consisting of a bulldozer trench and an inaccessible adit in Purcell basalt. It was screened out because the commodity being explored for was barite and because the location was inaccurate (described as the south end of Lost Lake in Johns, 1970).

<u>Bonus Claim</u>
LN005762

This site was screened out because there was no access into the area shown on the topographic map, the location was +/-1 km and there were no references to it in the MILS database.

<u>Boulder Hill</u>
LN006030

This site was described by Johns (1960) as being inactive for the past 10 years. The property was reported as a prospect with two short inaccessible adits and 50 pits and trenches; was unable to locate.

Cabinet
LN004542

This site was screened out because of the inability to locate this mine, and there were not any references found.

Cabinet Queen
LN005766

No disturbance was visible at the Cabinet Queen in 1997. The adit described in Gibson (1948) was 550 feet long and was started in the Grouse Mountain dike and then hit the Prichard argillite. The vein here was quartz/calcite with arsenopyrite, pyrite, sphalerite, and lesser galena and chalcopyrite (Gibson, 1948). The property was reported by Johns (1970) to have been active as recently as 1958.

Cableway Group
LN006066

This site was screened out because it had only one reference in literature (MBMG Bulletin 95, p. 15) which stated that it was a silver - lead - gold prospect and its status was "developing". It was claimed by Donald C. and Marie Cripe of Libby, Montana. The location was described as being in section 33, T28N, R31W.

Callahan Creek Placer
LN006090

This site was screened out because it was a placer mine, and there were no references found.

China Creek
LN005774

This site was screened out because it did not have references listed in the MILS database, it is a placer, and it had a very inaccurate location.

Christmas Tree Mine
LN005778

This site was screened out because it is located on a dry ridgetop, and there were no references listed. This site was also located on state land.

Comet Placer
LN005590

Many placer claims located on Little Cheery Creek near its confluence with Libby Creek were bought by Comet Mining Co. (Gibson, 1948). The pay streak is contained by stream gravels and heavy overburden (Gibson, 1948). This placer was screened out because it was a placer, and the ownership is probably mostly private.

Condor Mining and Leasing
LN004212

This site was screened out because it is a placer. There were no references listed for this site.

Copeland
LN005994

This placer and prospect was screened out because of the small nature of the workings. The tunnel is caved, but the size of the dump indicates that the tunnel was about 40 ft to 60 ft long (Johns, 1961). The Copeland placer mine is located in the NE corner of the SE Yaak River quadrangle and a mile and a half west of the mouth of Copeland Creek.

Copper Mountain
LN004272

This site was screened out because it plotted on private land (but may be on public?), the only reference was a USBM mineral property file and the precision was +/-1 km. The commodities were listed as copper, silver, and gold.

Copper Mountain Mine
LN006054

This mine was screened out because it was owned privately (Crowley, 1960).

Copper Iron Occurrence
LN005814

This occurrence was screened out because it had an inaccurate location, it is an unnamed occurrence and there were no references to it in the MILS database.

Copper, Lead, Iron, and Manganese Occurrence
LN005622

This occurrence was screened out because it had no references in the MILS database, the location was +/-1 km, and it is an unnamed occurrence. It is unknown if the occurrence is on private or forest land, but it is probably of forest land.

Copper, Silver, and Iron Occurrence
LN005718

This site was screened out because it had an accuracy of +/-1 km, there were no references, and it was an occurrence only. The commodities were listed as gold, silver, iron, copper, and zinc. The ownership was unknown.

Cow Creek
LN005782

This occurrence was screened out because it may be private, it is a placer and there are no references to it in the MILS database.

Crescent Tunnel
LN004232

The general area where this mine was plotted was visited but we were unable to locate it. It is even labeled on the Troy 7.5-min. quadrangle but only a prospect was found in this area.

Daniel Lee
LN006186

This prospect was screened out because it was described as being located in section 26, T29N, R34W, and a different location was found in Hayes (1984). It was also described as a prospect only. Johns (1959) states that there is a quartz vein (10 to 15 feet wide) that is vertical, and one pit has been excavated on the vein. The vein is in Ravalli quartzite and argillite. Quartz makes up 95 to 98 percent of the vein. The commodities were lead and copper.

Demonstrator
LN005546

According to Gibson (1948), this site consists of several small veins of quartz disseminated with galena, pyrite, and sphalerite in the Wallace Formation on the north fork of Prospect Creek, This study was unable to locate the Demonstrator.

Denver 1 & 2
LN004179

The general area of this mine was visited, but the exact location was never identified because there were no references to it. The Herbert mine was located to the southeast of where this mine was plotted. No environmental problems were noted.

D. and W.
LN005702

The following summary is from Gibson (1948). This group of claims were located on Prospect Creek and consisted of the Last Turn, Wakefield and others. The Ida V. adit was driven 500 feet on a NW-striking quartz vein in the Wallace Formation. Metallic minerals include pyrite, galena, and sphalerite. There was at least one other adit at the D. & W. according to Gibson.

The general area was visited; only caved adits or prospects were found. Access was gained via the road to the Herbert. The exact location of the mine was not determined (Gibson states only that the group was located on Prospect Creek).

Darling Placer
LN005906

This site was screened out because it was a placer and only reference to it stated that it consisted of pits and trenches (MBMG Bulletin 17, 1960, p. 35). It was operated in 1929. Production consisted of 20 ounces in 2 years (Johns, 1960).

Diamond John
LN004412

Gibson (1948) states that the Diamond John mine is located on the north side of Libby Creek, and it is about 3 miles (road and trail) above the main road to Howard Lake. There is a 60-foot adit along 2 quartz veins and small amounts of gold and silver have been assayed. The location of the mine was inaccurate.

Dome

LN005662

This site was screened out and was not visited because Gibson (1948) described the workings as a small cut and outcrops only. The occurrence is associated with quartz veins in the Wallace Formation's sandstone. The metallic mineralization includes pyrite, specular hematite and limonite (Gibson, 1948).

Double Mac

LN005582

This site was screened out and was not visited because Gibson (1948) described the workings as a small cut and outcrops. The occurrence is associated with quartz veins in the Wallace Formation's sandstone. The metallic mineralization includes pyrite, specular hematite and limonite (Gibson, 1948).

Gibson (1948) states that the Double Mac mine consists of two short adits and several pits following quartz veins lying parallel to the bedding in quartzitic sandstone of the Ravalli Formation. The mine has been reclaimed with the adits closed off. It is on the north side of the parking lot to the Granite Creek trailhead.

Duplex-Sugar Queen

LN004532

This mine was described by Dahlem (1959) as being one adit located in a Purcell sill southwest of the Leonia fault. Production was 100 tons of lead and zinc ore. Ore minerals included galena, sphalerite, chalcopyrite, and bornite. It was located in the 1930's and was presumably being worked in the 1950's. A small write-up on the Duplex-Sugar Queen was in Young and others (1962) who described the ore minerals as galena, pyrite and quartz found in a N50°E 60°SE vein that varied from a few inches to 3 feet.

Esther May Asbestos

LN006126

This site was screened out because it was described as two unpatented claims which had drilling and two surface pits only as a method of exploration (Johns 1959). The occurrence was described as being a tremolite and anthophyllite asbestos vein in Wallace Formation.

Fairbault

LN005678

The Fairbault Mining Co. includes five claims on the south side of Cherry Creek. They are about a mile above the Copper Reward group of prospects (Gibson, 1948). There is an adit that is 335 ft long at an elevation of 4,100 ft. Assays show that there is a little gold and silver in the ore body (Gibson, 1948).

Ferrel

LN006154

This mine was described in Johns (1959) as an inaccessible adit in section 9, T33N, R33W but ¼ mile west of the Yaak road which contradicts the section location. This site was screened out because of this inaccurate location. The adit was inaccessible in 1959 according to Johns (1959).

Fisher River Property
LN005786

This is listed in the MILS database as a gold prospect, with an accuracy of +/-1 km. No other references were listed.

Fisher River Quarry
LN004287

This site was screened out because it was listed as a quarry, its commodities were listed as gold and silver, and there were no references listed for the site. These factors indicate that it was probably only an occurrence or prospect.

Ford Placer
LN004322

The Ford placer was once included in the Midas mine (Johns, 1970). The general area was visited but no placer disturbances were noted. Ownership is mixed (on private land and on KNF-administered land).

Getner Placer
LN005602

This occurrence was screened out because it was a placer, it plotted on private land and there was only one reference to it—USGS Bulletin 956, 1948, p. 128, plate 1. The Getner placer mine was located on Libby Creek just below Crazyman Creek (Gibson, 1948).

Gibralter Ridge Mine
LN008356

This mine was an unnamed adit symbol on the Mount Marston 7.5-min. quadrangle; the name "Gibralter Ridge mine" was coined for this report. The mine was located on the Gibralter Ridge trail. The site was visited and a small opening was found beyond a caved portal.

Gloria
LN005938

The Gloria was previously known as the Little Annie (Johns, 1970) and was originally mined by the Golden West Mining Company. Two nearly parallel adits, trending N10°W, were connected by a crosscut and totaled approximately 300 feet (Gibson, 1948). The host rock is Prichard argillite and sandstone; quartz veins carry sphalerite, pyrite, galena, and native gold (Gibson, 1948). The veins roughly parallel the nearly vertical beds in the sedimentary rocks. When visited in 1997, one adit discharged a small amount of water and was open.

Goat Creek
LN008357
This site was screened out because of the inability to locate the site, and there were no references listed for this site.

Golden West or “New” Mine
LN005942
This mine lies on the opposite (south) side of the West Fisher Creek valley and is described as the Gloria or Little Annie mine. It is reached by an overgrown road that crosses the creek on the east side of the grassy clearing and switchbacks up the hillside. A hoist engine and another small motor is located on a flat loading area well below the mines. A cable leads from the hoist up the steep hillside to the adits. A trail switchbacks above the loading area, also leading to the adits. The four adit portals follow the contours of the hillside. They were driven to the south along bedding plane quartz veins which appear to pinch and swell. Three open adits and one collapsed adit were located as well as additional small prospects into the hillside. Water from the drainage to the west was probably piped to the east for the mining operations. A compressor line also remains between the mines. The adits were all dry at the time of this study but evidence was present of a small discharge from at least two of them (eroded rills on the dump of adit #2 and small soggy areas to the north of the adits' portals). The site lies well above West Fisher Creek and is unlikely to affect water quality there. There was no evidence that the discharge ever reached an active drainage.

Gibson (1948) discusses the "New" mine of the Golden West Mining Company, but at that time, only one adit was present. It is interesting to note that the quartzite beds are uniformly dipping shallowly to the south at the adits but become tightly (and spectacularly) folded to the west toward the unnamed drainage which flows into the West Fisher. The host rock is probably the Prichard Formation. Only trace sulfides were noted on the dumps.

Goldflint-Keystone
LN004327
The Goldflint and Keystone are two patented claims that are associated with the New Morning Glory mine at Sylvanite. Johns (1970) described their workings as a 200-foot tunnel and a raise (Keystone) and a 360-foot tunnel and raise at the Goldflint. The Keystone Group supposedly had two adits (700 and 900 feet in length) by 1910. A 1- to 2-foot quartz vein in Prichard quartzite was the target of these mines with ore minerals of auriferous pyrite and native gold (Johns, 1970). The site may have open raises (Johns, 1970) or glory holes on private land (MBMG files).

Granite Concrete Pit and Plant
LN004307
This site was screened out because it was a sand and gravel pit and it was plotted on private land. There were no references to this site in the MILS database.

Granite Creek Mining Company
LN005666
Granite Creek Mining Company was formerly known as the Mountain Rose. The property consisted of 10 claims in 1936 located on the south side of Granite Creek half a mile east of the Snowshoe fault (Johns, 1970).This site was visited by following the cable up the hillside from the downed aerial tram connecting the adit with the former camp along Granite Creek. The adit was open with no discharge developed in bedded quartzite that dips 77° E.

Great Northern Property
LN004332
This site was screened out because of the inability to locate the mine. There were no references listed for this site.

Grizzly Property/Missouri/McDonald
LN006170
The Grizzly Claims (formerly the Missouri Group) are located on Leigh Creek about two miles above the confluence of Leigh Creek and Cherry Creek (Johns, 1959). The Grizzly property was also identified as the McDonald property by Billingsly, and there are seven unpatented claims (Johns, 1970). Many adits were driven at altitudes of 3,600 and 4,400 ft. The most abundant gangue material in the veins is quartz (Gibson, 1948). This site was screened out because the inability to locate the mine.

Grouse Creek
LN008391
The Grouse Creek site was a newly coined term for the AIM program. One open adit was found and was estimated at 500 feet to 1,000 feet of workings. Black to gray siltstone and sandstone, with a small amount of iron oxide (possibly from a shear zone) was found on the waste dump. The dump was heavily vegetated. A small amount of standing water was inside the adit but showed no evidence of flowing. No sulfides were noted. No structures were present at the site.

Halfmoon
LN004337
This site is located a little more than a half of a mile east of the Snowshoe fault and 600 feet south of the Poorman Creek and Cable Creek divide. It is an unpatented claim, and a tunnel exposes a 22–24 inch vein. Development work includes a ten-foot tunnel and two pits (Johns, 1970).

Hannigan (Libby)
LN005930
The Hannegan was previously known as the Libby (Johns, 1970). Gibson (1948) described the Libby which is located west of the Tip Top or Jumbo group. The adits were located in July, 1998 and all were caved. They are largely if not entirely on private land. Prichard Formation hosts the irregular quartz veins that range in size from less than an inch to several feet in width (Gibson,

1948). Minerals include quartz, galena, anglesite, cerussite, pyromorphite, native gold, and iron oxides (Johns, 1970).

<u>Hansen</u>
LN004347

This mine is located off of a small trail which takes off from the second major switchback on the Burma road (Blacktail Trail #92). Its location is shown in Johns (1970). The adit was open and dry when visited in 1998 with no timbers or stulls.

It was driven in Purcell Lava following a quartz vein with sulfides and some oxides. Johns (1970) stated that it was 57 ft long and that the vein contained quartz, chalcopyrite, barite and pyrite with lesser copper-bearing minerals. Nesbitt (USFS, oral commun., 1998) thought that this may also be known as the Little Princess mine.

<u>Harry Howard Placer</u>
LN005598

This site was screened out because it is a placer, and there was only one reference to it, USGS Bulletin 956, 1948, p. 128, plate 1. Harry Howard's claims were located on Cherry Creek near the mouth of Smearl Creek (Gibson, 1948.)

<u>Hathaway</u>
LN005914

This mine is on the hillside north of highway 37 near Canoe Gulch District Ranger Station. Johns (1970) claims no ore was produced from the Hathaway, but development work consisted of a 300 foot adit with crosscuts, and one open cut exposing the vein 150 ft north of the adit portal. A visit to the site found the adit partially open and dry.

<u>Heintz Ra Construction</u>
LN004292

This site was screened out because its commodity in the MILS database was listed as quartzite dimension stone.

<u>Herbert</u>
LN006070

The Herbert mine is located on the Little Hoodoo Mountain 7.5-min. quadrangle and consists of one patented claim. On 09/01/98, there were two near vertical, open inclined shafts. No environmental problems were found. Gibson (1948) reported that the original mine consisted of 10 claims which had two adits and several trenches. In 1934, two adits, one of which was 300 ft, had been driven into shales and sandstones of the Wallace Formation. Both these adits were caved in 1998. The mineralization was found in narrow, NW-trending, quartz-pyrite veins. The mine was listed as "developing" in 1974 (Lawson, 1975).

Hiawatha

LN005630

The Hiawatha's adit was covered by talus when visited in 07/29/97. It was also associated with the Grouse Mountain dike like many of the other mines in the area. The ore on the dump had quartz-galena veins (Gibson, 1948). The mine may have been active as recently as the 1950's (Johns, 1970).

Hoerner

LN005974

This report is referenced by Johns (1961) and was described as being on the "west side of Spread Creek" in section 3, T35N, R33W. The mineralization was found in a 8- to 28-in. thick, east-west striking, quartz vein that was adjacent to a metadiorite sill. The vein itself was in Prichard Argillite. The road along the west side of the creek was driven but no workings were found.

Horse Hill

LN004237

Location for this site is described by Johns (1962) as just northwest of Horse Hill Lookout in the SW¼ section 30, T30N, R26W consisting of an inactive prospect developed by a short adit and winze filled with water. This site was not visited because of the inability to locate the mine.

Howard Creek Claim

LN004342

The MILS database lists USGS Bulletin 956 (Gibson, 1948) as the only reference for this site. Only a vague reference to claims on Howard Creek were noted so this site was screened out. According to Gibson, this site was one of the earliest enterprises, and this site is where some of the coarsest gold was found on this creek.

Hoyt

LN004054

This site was visited on 08/11/98 and was found to have an open inclined shaft. The workings were found on a small inlier of KNF-administered land surrounded by privately owned land. Johns (1961) described the inclined shaft as 170 ft long that was driven into the Warland syenite stock. The workings explored a 14- to 16-in. quartz vein (Johns, 1961). The same report said that there may have been a mill constructed here at one time.

Irish Boy and Rambler

LN005934

The Irish Boy and Rambler claims were described in both Gibson (1948) and Johns (1970). The claims explore the Prichard sandstones and argillites and their associated veins. The quartz veins contain galena, anglesite, limonite, sericite and carbonate. When visited in 1998, the adits were difficult to distinguish. The road was easily spotted by its stacked rocks to the southeast of the Lake Creek trail. The road soon degraded into an overgrown trail. Both adits were mostly closed but were considered open because they still had a small crawl-space at the opening.

Iron Occurrence
LN004094

This iron occurrence is located east of the J. D. Daniel ranch and about 50 feet east of Volcour road (Johns, 1961). A vein outcropped in the Prichard argillite that was several feet wide (Johns, 1961). This site was screened out because of its small size and insignificant mineralization.

Iron Occurrence
LN005890

Four miles northwest of Libby (near the center of section 36 T31N, R31W), veinlets of quartz associate with metadiorite sill occur, and a sample contained 0.16 percent copper, 11.80 percent iron, 0.60 ounces of silver, and a trace of gold, zinc, and manganese (Johns, 1960).

Iron-Copper Occurrence
LN005838

This site was screened out because it had an accuracy of +/-1 km, it had no references in the MILS database, and it was an unnamed copper-iron occurrence.

Iron Occurrence
LN005710

This site was screened out because there were no references to it in the MILS database, it is listed as an iron occurrence, and the location is inaccurate.

Iron/Phosphate Occurrence
LN005854

This site was screened out because it had no references to it in the MILS database, it had an inaccurate location (+/-1 km) and was listed only as an occurrence.

Jager (Rex)
LN004029

D. Nesbit (KNF) reported that the "opening to mine has caved in; leaving an opening into the tunneled mine shaft." The site visit by MBMG on 08/07/97 found a caved portal but with an open hole into the adit. The mine lies 4.9 miles from Highway 93 along the Deep Creek road.

The six original claims were located in 1929 exploring a "6- to 8-in. silver-bearing galena-chlorite vein" (Johns, 1970). The vein is in both a metadiorite sill and in argillites of the Piegan (?) Group (Johns, 1970). Two adits were described: a 70-ft adit and a 476-ft lower adit. A series of NW-trending bedding plane faults were mapped in the mine.

John Francis Claims
LN004164

This property was screened out because there was no references for it in the MILS database, no mine symbols on the topographic map and an accuracy of +/- 1 km. The MILS database does list a mineral property file 21.104 for it. It is listed as a copper prospect.

Jumbo

LN005918

The Jumbo group was also known as the Tip Top (Gibson, 1948); also the Blacktail and the New Deal properties (Johns, 1970). In 1998, three adits were open but secured with chainlink and barbed wire. Two other adits were partly open and one was completely caved. An adit downhill from the trail had caved and was eroding away the trail. The adits were fairly short (+/-300 ft) but there were several along the same horizon. An aerial tramway was described in Gibson (1948) and the remains of a concrete and rock base was found in front of one of the adits. The cable from the tramway stretches down to just east of the American Kootenai mine. Minerals associated with the Tip Top or Jumbo include quartz, sericite, sphalerite, pyrite, pyrrhotite, and iron oxides (Gilbert, 1948). The host rock is Prichard argillites and sandstones.

Keeler Mountain

LN005654

According to Gibson (1948), the Keeler Mountain prospect is at the base of Keeler Mountain. It is developed by an adit that is 120 feet long, and the adit has intersected many quartz veins. This site was screened out because of the poor location accuracy.

Kenelty

LN004009

Small stringers of quartz and iron oxides were found by Gerald Kenelty and there were two claims staked (Johns, 1961). The veins range from ¼- to 6-in. wide (Johns, 1961).

Kenelty Mine

LN006034

This occurrence was screened out because it was plotted on private land. It is a barite dig with three trenches and a strip pit 175 by 18 by 5½ ft, and it is located about two miles south of Loon Lake (Johns, 1970).

Kennedy

LN005878

This site was screened out because it had no significant workings. This group of claims are located on the north side of Kennedy Gulch and east of State Highway 37, and there are several bulldozer cuts (Johns, 1960).

King Mine / Silver Butte

LN004357

This property was not examined because the access was restricted by a "Keep Out" sign, and it is on private, patented land. No work has obviously been done on the property in quite a while because the road was overgrown with alders. Johns (1970, p. 122) described the property as having two different mills in the past: a pre-1905, 150-ton mill destroyed by fire and a later (1950's) 80-ton flotation mill which was dismantled. There is presently at least one intact building, but Johns reported that most other mine buildings were either destroyed or collapsed. A summary from Johns includes: the property was developed by four adits totaling 4,300 feet in quartz /galena/pyrite/chalcopyrite and sphalerite veins in Prichard argillite. Two adits were accessible in 1970. According to Bobbie Lacklen (1997, USFS, Libby RD, oral commun.) the site was considered for a land exchange but was rejected because of the presence of mill tailings and their possible liability. One sample was taken downstream on USFS land to test the total metals impact of the mine.

<u>Kirkpatrick</u>
LN004059

This site was screened out because it is located on private land and is unlikely to impact public land. The workings reported in Johns (1960, MBMG Bulletin 17, p. 28-29) included a 80-ft adit, a 35-ft caved shaft and a bulldozer cut.

<u>Kootenai River Placer</u>
LN006102

This site was screened out because it was most likely flooded when the reservoir, Lake Koocanusa, formed. About 1,100 cubic yards of gravel was treated by a stationary washing plant, and thirteen ounces of gold was recovered (Lyden, 1948).

<u>Kotschevar Barite</u>
LN006166

Johns (1970) states that the Kotschevar (Copper Mountain group) is located on Copper Mountain about five miles south of Troy. There are nine unpatented claims and three millsites. There is an 80 ft and a 35 ft adit and many pits and cuts on the multiple veins. This site was screened out because it was a barite mine.

<u>Larue-Cripe Asbestos</u>
LN006126

This prospect was screened out because it was described as surface pits only (Johns, 1959) and was a tremolite asbestos occurrence in the Wallace Formation argillite. It also had a general location occurring in section 26, T35N, R32W, 1½-miles southwest of Roderick Butte.

<u>Last Chance</u>
LN006178

This site had a caved adit and was dry on a dry hillside when visited 07/29/1997. The mine was formerly called the Little Spokane (Johns, 1970). The adit started in Prichard argillite and then encountered the Grouse Mountain dike. The adits were 150 to 200 ft long. No production was reported as of 1959 (Johns, 1970).

<u>Last Chance Group/Paston</u>
LN004199

This site was screened out because it was private, it was a vermiculite mine and it was combined with Vermiculite Mountain mine (LN006190). The Last Chance Group includes eight unpatented claims ( Johns, 1970).

Leigh Creek

LN004302

This site was screened out because there were no references and it could not be located when the general area was visited.

Liberty Metals

LN004317

This site was screened out because it is located on private land and it has no effect on the Kootenai National Forest. The Liberty Metals mine is located on Iron Creek and is six miles south of Troy (Johns, 1970). The property consists of eight patented claims and nine unpatented claims (Johns, 1970).

Libby Creek Gold Mining Co.

LN004207

This site was screened out because it was a placer deposit and its location was inaccurate. The claims of the Libby Creek Gold Mining Co. are located on Howard Creek and on Libby Creek near the junction of the two creeks (Gibson, 1948).

Libby Creek Placer

LN006042

This site was screened out because it is a placer. The ownership in this area is primarily private.

Libby Pit

LN004592

This site was screened out because it was a gravel pit, and there were no further references to it in the MILS database. It was shown as being located on KNF-administered land on the blueline ownership 7.5-min topographic map.

Libby Sand and Gravel Pit

LN004312

This site was screened out because it was a sand and gravel occurrence, and it plots on private land. There were no references for it in the MILS database.

Limestone Occurrence

LN005614

This prospect was screened out because it was a limestone occurrence and was on private land.

Limestone Occurrence

LN005834

This occurrence was screened out because it is a limestone occurrence, and there were no references for it in the MILS database.

Limestone Occurrence
LN006046

This site was screened out because it is a calcareous tuffa deposit (MBMG Memoir 12, 1959, p. 51) and is on private property. It is located one half mile from the Great Northern railroad.

Little Spokane
LN005634

Gibson (1948) states that the Little Spokane prospect is located on the North Fork of Keeler Creek, and a adit penetrated the Grouse Mountain dike (the adit was caving). The Little Spokane prospect became part of the Liberty Metals group. There are two unpatented claims (Johns, 1970). This prospect was screened because it is located on a ridgetop and is dry.

Lost Cause
LN004547

There were no references for this site. It was visited in 1997 and was found to have a heavily vegetated dump with a few hundred feet of workings indicated. There was possibly a caved shaft at the site. The ownership of the land was not determined.

Lucky Mac Group
LN004372

The Lucky Mac's location was inaccurate (somewhere in section 28), and the reference to it reported no workings. There were six to eight claims in the Raves and the Lucky Mac groups and they are located about two miles southwest of the Zonolite Corp. mine (Johns, 1960).

Lukens - Hazel
LN004204

This mine was also known as the Glacier Silver-Lead and is located at the junction of Granite and Shaughnessy creeks. More than 10,500 ft of workings were explored in at least four levels, and the deposit was split into the East and West veins (Gibson, 1948). The site had a 325-ton per day mill.

Presently, the mill has been dismantled and burned. The effects of private land was evaluated by sampling upstream and downstream on KNF-administered land. No open adits were noted in 1998; safety hazards on private land were not evaluated.

Lynx Creek
LN004377

This occurrence was screened out because there were no references to it in the MILS database, and it had an inaccurate location. It is a talc occurrence.

Mn, Pb, Cu, Fe Occurrence
LN005714

This site was screened out because it had no references to it in the MILS database, it is listed as an unnamed mineral occurrence, and the accuracy was +/-1 km.

Mastodon/Barbara Claims/Kavalla

LN004382

Lacklen (oral commun, 1998) stated that this prospect was an active operation. She said that there was an open timbered shaft on the property. There were no references in the MILS database. The site was not visited because it was considered active.

McGuire Prospect

LN004387

This property was screened out because it had no references to it in the MILS database, it was listed as only a prospect, and the accuracy was +/- 1 km.

Metallic Minerals Occurrence

LN005982

This site was screened out because of the vague location description, the small nature of the workings and because it was described as an occurrence in float only.

Midas

LN005910

Gibson (1948) described the Midas as totaling 3,000 ft of workings with a 75-ton flotation/ cyanide mill, with production (up to 1948) totaling $59,000. The claims were originally located in 1905 with early production in 1916 to 1918 with both gold and tungsten produced, and later gold, silver, copper and lead. Again according to Gibson (1948), mineralization included quartz, scheelite, and carbonate with sericite, chlorite, galena and tetrahedrite. He states that "native gold associated with iron oxide, malachite, and scheelite can be seen with the aid of a hand lens".

Prospects and two partially caved shafts remain on the patented land. Presently (1997), all the workings on KNF-administered land are caved and only the concrete footings remain at the mill site. Two wooden buildings are in poor condition, and there is an ore bin and the remains of a wooden tram above the mill's ruins. No tailings were identified in the drainage.

Miller Placer

LN005894

Located along Fisher Creek about two miles south of Teeters Peak is Miller Placer. The developmental work done was a 100-ft shaft (inaccessible),and a churn drill hole (110 ft deep) (Johns, 1970). No production has been reported (Johns, 1970).

Milton Group

LN005802

This site was screened out because there were not any references listed and the site is located on private land with no effect on the Kootenai National Forest.

Missouri (Grizzly)

LN005554

This site is the same as the Grizzly. The Missouri group is made up of seven claims located on the north side of Leigh Creek, about two miles above its confluence with Cherry Creek (Gibson, 1948). Many short adits were driven on quartz veins along a shear zone striking northwestward (Gibson, 1948).

Moen
LN004392

The area where this mine was plotted by Johns (1970) was visited but no evidence of the mine was noted. It was described by Johns (1970) as a 40 by 4 by 4-ft trench which was dug a few hundred feet southwest of a switchback on the Burma road. The commodity was barite with minerals present including barite, quartz, iron oxides, with lesser amounts of chalcopyrite, tenorite, malachite, and manganese oxide.

Montana Morning
LN004039

The Montana Morning prospect is located near the head of Iron Creek in the south eastern part of section 28 (Gibson, 1948). There is an adit and several crosscuts which are all located in a dike, but there is also another adit in the Prichard sediments (Gibson, 1948). There are four unpatented claims (Johns, 1970). This site is also listed as active.

Montana Placer
LN005594

This occurrence was screened out because it is a placer, and only had one reference in the MILS data base–USGS Bulletin 956, p. 128 and plate 1. The ownership is uncertain; both private and KNF-administered land occur in the area. Ten claims on Cherry Creek near Snowshoe Creek are included in Montana Placer (Gibson, 1948).

Montana Premier
LN005578

Gibson (1948) states that most of the Montana Premier prospect is located in section 28 on the west slope of Copper Mountain, and the Montana Premier prospect includes eight claims. This prospect is located on private land.

Montanore Adit
LN008401

The ownership of this site is mixed, it is considered active, and there were no references listed.

Montanore Project Adit and Plant Site
LN008400

The ownership of this site is mixed, it is considered active, and there were no references listed.

Montezuma
LN006018

The Montezuma prospect is located about two miles southeast of the Midas mine and includes six unpatented claims (Johns, 1960). There are two adits and an inaccessible 30-ft inclined shaft.

There are also 12 or more pits and trenches (Johns, 1960). Quartz veins from a few inches thick up to 20 inches thick have been explored (Gibson, 1948).

<u>Mountain Rose or Granite Creek</u>
LN005666

Gibson (1948) described the Mountain Rose prospect as five unpatented claims with an aerial tram that connected the mine with a camp on Granite Creek. A 98-ft long adit with a 770-ft long crosscut hit a series of NW-striking quartz-sulfide veins. The veins were largely bedding- plane controlled and were 1 to 12 in. thick. Minerals included pyrite, galena, sphalerite with lesser pyrrhotite and chalcopyrite (Gibson, 1948).

<u>Mustang</u>
LN005954

This mine was considered active in 1998. In 1948, Gibson described a 300-ft long adit and Johns (1970) describes a 700-ft long adit, presumably the same adit. When visited on 08/19/98, no activity was noted. Two shallow "beginnings" of adits (one used for storage) and two other open adits were noted at a large open flat cut. The upper adit's portal was locked; the lower one was open but only extended back 35 ft. A spring with small discharge is captured as a water source but is not near the waste dumps. A locked "powder house" was also located on the property. Rockie Nethercutt was the mine’s last known operator.

Gibson (1948) described a 7-in. to 18-in. quartz vein in the Ravalli Formation's sandy or shaley argillites. Minerals include pyrite, galena, and iron oxide with lesser pyromorphite and disseminated pyrrhotite.

<u>Nancy</u>
LN004252

This is listed in the MILS database as a copper, gold, silver occurrence, but there are no references for it. It has an accuracy of +/- 1 km, and it is possibly private. For these reasons, it was screened out.

<u>Napoleon Prospect</u>
LN004397

MILS listed this occurrence's commodities as lead, vanadium, zinc, copper and strontium. The location was inaccurate (+/-1 km) and the property may be private. The site was screened out. There were no references for this site.

<u>New Morning Glory</u>
LN006134

The exact location of the New Morning Glory mine is somewhat ambiguous but the mine name seems to refer to several unpatented and four patented claims including the Keystone and Goldflint. This study refers to the cluster of workings immediately to the west of the community of Sylvanite. There appears to be two main adits, one of which is open and with standing water associated with it. The other adit to the south is located to the west of a rock pile with a small cabin on it. A claim map from the MBMG files shows these workings on the Bluestone and Bluestone No.2 unpatented claims.

Johns (1970) describes the occurrence here as associated with Prichard quartzite with the mineralization in northwest-trending quartz veins. Regionally the veins are situated in longitudinal faults associated with the Sylvanite anticline.

Nugget Placer
LN005542

This placer was screened out because it lies on private land and it is a placer, with little, if any, impact on federal lands. The Nugget Placer has many claims on Libby Creek located about a mile below the mouth of Bear Creek (Gibson, 1948).

Olsen and Switzer
LN006106

Eight unpatented claims are located near the head of Bramlet Creek in the Prichard formation which lies horizontal or dips slightly to the north, northeast, or southeast. The 6 in.–48 in. quartz veins have been disturbed by faults (Gibson, 1948).

Oro-Highland
LN006058

This property consists of two adits and a bulldozer cut (Johns, 1970). Ore minerals include galena, argentite and quartz (Young et al., 1962) with Johns additionally listing anglesite, pyrite, and chalcopyrite as ore minerals. The metadiorite dike here strikes N40°W (Johns, 1970).

Phillips
LN005970

This site was screened out because the workings were described as a eight-foot prospect into the hillside (Johns, 1961). The site may be on private land. The mineralization is associated with a NW fault that crosses the Yaak River at the site, with a quartz vein containing pyrite, malachite, and iron oxides.

Potter
LN006026

This prospect is located on private land surrounded by Plum Creek Timber land. There is no effect on National Forest land. The prospect lies about two miles west of Loon Lake and a half mile north of US Highway 2 (Johns, 1970). References also include Johns (1960).

Rankin
LN006150

The site was screened out because it was only a six-foot prospect. There are several quartz veinlets ranging from ¼- to 3-in. wide (Johns, 1959).

Raven

LN005998

This site was screened out because it's location was inaccurate (somewhere in section 21) and the reference to it reported no workings. There are six to eight claims that were staked by Messers, J. D. Daniels, H. C. Daniels, and H. Daniels. The claims are located about two miles southeast of the Zonolite Corp. mine (Johns, 1960). The development includes a 20-foot adit and nine bulldozer cuts, along with two pits exposing a vein. No production has been reported on the property (Johns, 1960).

Red Gulch Placer

LN005586

Located below the mouth of Little Cherry Creek, Red Gulch Mining brought water by ditch from Cable Creek and Bear Creek. West of the present workings pits had been sunk until some gold was found at the bedrock (Gibson, 1948). The deposit was screened out both because it was a placer and because it's location was described approximately.

Remp/Silver Ghost

LN005566

The Remp mine, located at the head of Cedar Creek was screened out because of the small nature of the workings, and because of the small nature of the deposit and the remote location. It may also be considered an active mining operation. The Remp mine had workings that consisted of a 220 foot trench, a 20-ft long adit, and two caved adits (USGS Bulletin 1501). Other workings listed include a 35-ft inclined shaft and several small trenches. At the time of the USGS report, a 35-ft long adit was being driven to intersect the vein.

St. Paul or Zollars

LN006062

The St. Paul mine was recently worked (in the 1990's) but no work had been done in 1998. The group originally consisted of seven claims (Gibson, 1948) and the group stretches from Snowshoe Creek over the ridge to Cherry Creek. The Snowshoe side had been the most recently worked. There were three open, or partially open, adits and a mucker and other mining equipment was still present in 1998. Wooden doors secured the adits. The adit on the Cherry Creek side was completely caved and there was evidence of a small seasonal discharge. The discharge was too small to sample when visited in 1998.

The mine is hosted by Ravalli sandstones, quartzites, and argillites (Gibson, 1948) and the workings explore the Snowshoe Fault. Ore minerals galena, sphalerite, and chalcopyrite in a quartz gangue (Johns, 1970).

Seattle

LN005558

Five unpatented claims were located on a quartz vein in the Ravalli Group that strikes N45° to 50°W and dips 35° to 40°NE (Johns, 1970). This site was screened out because there are no references to any workings on the claims (Gibson, 1948).

Seclusion (A.C. Lewis)
LN008514

Reclamation was in progress at this site when visited on 07/29/98. The adit area was being recontoured and it looked as if some of the old equipment and timbers that had been stored were also being removed. The ruins of one cabin remained. No other information on the mine could be found.

Schmitz
LN004194

The Schmitz mine is in the Eureka mining district. The two east-trending adits were both caved but they both had open holes that provided access into the adit (in 08/1997). "The mine shaft is completely caved in and you have to look for the old adit to find it" from personal commun., D. Nesbit, KNF.

Silver Grouse
LN005658

The MBMG geologist found one open adit here, but the waste dump had been totally eroded away by the creek. There was one cabin in good condition near the junction of roads. According to Gibson (1948), the site originally consisted of nine unpatented claims. He described a 300-ft long adit that explored quartz veins in the Ravalli sandstone. Minerals mined at the Silver Grouse included pyrrhotite, chalcopyrite, pyrite and biotite.

Silver King
LN006038

This site was visited on 07/29/97, and all adits were caved and dry with vegetated dumps. The lower adit was reported by Johns (1970) as having been 300-ft long with all three adits totaling 850 ft. The mine was worked in 1957; production was reported in 1929 and 1930 (Johns, 1970). Gibson (1948) wrote the original description of this mine.

Silvertip
LN004522

This deposit is a continuation of the vein explored by the Snowshoe mine on Snowshoe Creek (Gibson, 1948). The main working was driven along the Snowshoe fault for 300 ft (Johns, 1970) and the site has been inactive since at least 1926. These prospects were viewed from the Cherry Creek trail. No discharges were noted and because of the remote nature of the site few problems were anticipated.

Silvertip
LN008516

This mine was not in the original MILS database. It may be the same mine as described by Johns (1970) and Gibson (1948) as the Montezuma.

<u>Silver Strike</u>
LN005638
This was considered to be a part of the Grouse Mountain mine for the purpose of this study.

<u>Snipetown Placer</u>
LN006158
The Snipetown placer is located below Yaak Falls on the Yaak River. The ground was leased from E. Johnson, and the operators were R. Moore, J. Lewis, M. D. Powely, and Mr. Packingham (of the U. S. Immigration and Custom Services).The gold-bearing gravel was found above the river, and a flume was constructed to transport water. There are a few test pits and a collapsed adit (Johns, 1959).

<u>Solo Joe</u>
LN005990
This site was screened out because it is a placer, the location is inaccurate, and disturbance was limited to about one-half acre (Johns, 1961). The occurrence was located in the early 1900's and worked again in 1938–1940.

<u>Spar Lake Copper</u>
LN004262
Johns (1970) states that there are six unpatented claims located on the north side of Hiatt Creek. There have been four bulldozer cuts across the vein, and the vein is mostly made up of quartz (95%).

<u>Stonehill Placer</u>
LN005870
This occurrence was screened out because it was a placer, and it was reported to be last worked in the 1930's. The only reference to it is in Johns (1961, MBMG Bulletin 23, p. 36). He stated that it was private land although the Forest ownership map shows it as KNF-administered, and it is located a half mile south of Stonehill. The area of disturbance was described as 40 ft by 90 ft (Johns, 1961). The placer may have been flooded when the dam created reservoir Lake Koocanusa.

<u>Strodtbeck</u>
LN004537
This site was screened out because the workings present were reported to be a 10-ft discovery shaft / pits and trenches (Johns, 1960) in 1931. The production was reported to be one car of ore. Johns also stated that it had been inactive for many years.

<u>Sunrise Prospect</u>
LN006114
The sunrise prospect is located in the Libby quadrangle about 4-miles southeast of the southeast corner of the quadrangle. There is a quartz vein exposed for 1,000 ft, and the vein is 6 to 18 inches thick. Some gold is visible with a hand lens (Gibson, 1948).

Sylvanite Mill

LN008521

The eastern portion of this structure lies on private land while the map shows the western portion on KNF-administered land. Files at the MBMG contain a photo of a 25-ton stamp mill located at the Sylvanite site, owned by the Haywire Mining and Milling Company. Johns (1970, p. 111) described the property as first having a 10-stamp mill in 1897 at the Keystone, that was replaced by a 20-stamp mill at the Goldflint, that was replaced in 1910 by a 200-ton mill and a 2,400-ft aerial tramway. A large steel tank, a crusher and a hopper are all located on KNF-administered land, as well as the western part of the mill. The mill lies to the west of and, adjacent to, the small community of Sylvanite. No tailings were noted at the time of the inventory.

Texas Ranger Group

LN005694

Four claims about two miles west of the county road comprises the Texas Ranger Group. The claims are located along the Snowshoe fault zone which dips at 86° SE (Gibson, 1948). An adit has been driven S03°W; the east wall rock is of the Ravalli Formation, and the west wall rock is of the Wallace Formation (Gibson, 1948).

Tideman Placer

LN005898

This site was screened out because it is a placer which was reported to be fairly small and was worked from 1900 to approximately 1931. Most of the workings are located near the junction of Atlanta Creek and Wolf Creek, and production was on the order of 15 ounces in 1930 and 1931 (MBMG Bulletin 17, 1960, p. 17).

Trio

LN005570

There are two unpatented claims included in the Trio prospect, and the claims are located a half mile west of Bull Lake. The ore forms along a north striking fault zone that appears to be dipping at about 55° westward (Gibson, 1948). This site was screened out because there is no access along Emma Creek and the description of the site is vague.

Troy Unit/Project (Surface Plant and Offices)

LN004144

The mill here is on the Sawtooth Mountain quadrangle in section 26, T29N, R34W. The rest of the complex is on the Spar Lake 7.5-minute quadrangle. It is presently (1997) considered to be under "care and maintenance" by ASARCO.

Tobacco River Placer

LN006098

This site was screened out because it is both on private land and it is a placer deposit. Lyden (1987) reported that a small amount was reported to have been recovered here (near Eureka) in 1921.

Twin Peaks Prospect

LN004277

This prospect was screened out because of its inaccurate location (in sections, 6, 13, and 14). It was listed in MILS as a copper prospect but no references were listed.

Union

LN005926

The Union mine may have formerly been known as the Olsen and Switzer (Johns, 1960) but the location description is not exactly the same. The occurrence consists of eight patented claims. The deposit is hosted by Prichard Formation with quartz veins from six-in. to four-ft wide (Johns, 1960). Ore minerals included galena, sphalerite, pyrrhotite, chalcopyrite, and pyrite. These adits were collapsed when visited in 1998.

Universal

LN005642

This site was on private land but was investigated as viewed from KNF-administered land. All workings were covered by slumping except for an open cut. Original workings consisted of a 250-ft adit. The mine encountered the Grouse Mountain dike after passing through Prichard argillite (Gibson, 1948). Veins with the maximum with of six inches also contained galena, sphalerite, and lesser chalcopyrite, pyrrhotite, pyrite and marcasite (Gibson, 1948). The property was reported as active in 1958 (Johns, 1970)

Universal Zonolite Property

LN004247

The Universal Zonolite Insulation Company was formed in 1939, combining several independent operations (Johns, 1970, p. 147). In 1948 the name was changed to Zonolite Company and in 1964, the Zonolite Division was a part of W.R. Grace. It is predominantly private and has been reclaimed.

Unnamed Aluminum

LN005846

This site was screened out because it was only an unnamed aluminum occurrence with no other references to it in the MILS data base.

Unnamed Barite

LN005730

This occurrence was screened out because it was plotted on private land, it had a vague local, and was not in the MILS data base.

Unnamed Calcite

LN005830

This site was screened out because it's commodity was calcium, it's accuracy was +/-1 km and it may be the same as Wollastonite veins (LN006130). There were no references in the MILS data base.

<u>Unnamed Chlorite and Sericite</u>
LN004099
This site was screened out because it is a mica occurrence and an unnamed occurrence. There are several quartz veins containing chlorite and sericite ranging from one- to six-in. wide (Johns, 1961).

<u>Unnamed Clay</u>
LN006162
This site was screened out because it had little or no impact on KNF-administered land. It is an unnamed clay deposit.

<u>Unnamed Copper</u>
LN005818
This occurrence was screened out because there were no references to it in MILS, it is an unnamed occurrence and because of the uncertainty of the ownership (it was plotted as being on KNF-administered land but may be private or mixed ownership).

<u>Unnamed Copper</u>
LN005826
This occurrence was screened out because of an inaccurate location, no references in MILS and because it is an unnamed occurrence.

<u>Unnamed Copper</u>
LN005882
There are two quartz veins that are east striking 1,000 ft southeast of Fisher Mountain in the SE¼ section 31, T29N, R29W, and the two veins are 1-ft wide and about 50 ft apart. One vein contained quartz, sparse chalcopyrite, pyrite, tenorite (?), and azurite. Country rock is mud-cracked medium-gray argillite and calcareous limestone located in the Wallace Formation. Samples of the pit assayed 1.20% copper, and a trace of lead and silver (Johns, 1960).

<u>Unnamed Copper</u>
LN005886
A prospect near the Kootenai River is located on a cliff several hundred feet east of Canyon Creek Road, and a sample was assayed to be 0.54 percent copper, and a trace of lead and zinc (Johns, 1960).

<u>Unnamed Copper, Lead, and Gold</u>
LN005858
This site was screened out because it had no references to it in MILS, and the location was inaccurate (+/-1 km).

<u>Unnamed Feldspar and Mica</u>
LN005726
This site was screened out because it had an inaccurate location (it was in secs. 16, 21, 22, 27 and

28 as well as 33 according to the MILS data base). No references were listed for it in the MILS database. The commodities were listed as feldspar and mica.

<u>Unnamed Galena</u>
LN004084

This occurrence consists of a quartz vein, with traces of galena, chalcopyrite, pyrite, and native silver (Johns, 1961) that was sampled in a skid trail. It was found on the south side of Young Creek. The actual quartz vein was not found; the sample was float.

<u>Unnamed Gold</u>
LN005806

This occurrence was screened out; there were no references in the MILS data base, and it plotted on private land.

<u>Unnamed Gold</u>
LN005810

This occurrence was screened out because it was an unnamed occurrence, there were no references to it in the MILS data base, and the location was inaccurate.

<u>Unnamed Gold, Lead, and Copper</u>
LN005842

This occurrence was screened out because the location accuracy was +/-1 km, there were no references listed in the MILS data base, and it is plotted on private land (although the MILS data base listed it as National Forest).

<u>Unnamed Gold and Silver</u>
LN005618

This occurrence was screened out because it was plotted on private land, it had a vague location description, and there were no references to it in the MILS data base.

<u>Unnamed Gold and Silver</u>
LN005742

This deposit was screened out for several reasons: it was unnamed, it had no references in the MILS data base, and it was plotted on private land.

<u>Unnamed Gold and Silver</u>
LN005790

This deposit was screened out because there are no references to this deposit, and it is on private land.

<u>Unnamed Gold and Silver</u>
LN005822

This occurrence was screened out because of the inaccurate location, and there were no references in the MILS data base.

Unnamed Gold/Silver and Unnamed Gold
LN005862 and LN005866

Both of these sites plotted in a switchback on the South Fork of Meadow Creek road off of the Yaak River road. The area was visited briefly and some disturbance was noted in the area, but no signs of mine workings were noticed. The area looked remotely like it had been placered. No environmental effects were noted. No references were listed in the MILS data base.

Unnamed Limestone
LN005850

This site was screened out because it is only a limestone occurrence. It had no references to it in the MILS data base.

Unnamed Lead and Zinc
LN005746

This occurrence was screened out because it had no references in the MILS data base, it had an accuracy of +/-1 km, and it was an unnamed occurrence.

Unnamed Silver
LN005738

This site was screened out because the accuracy was +/-1 km, the name is "unnamed silver" and there were no references to it in MILS.

Unnamed Silver, Gold, Copper
LN005794

This site may be the one described in Johns (1961) as mineralization sampled from a roadcut and developed by a small prospect pit. The site was screened out because of the limited information on it and the small nature of the occurrence.

Unnamed Quartz
LN005610

MILS states this as a quartz prospect, but there are no other references listed. This prospect was screened out.

Unnamed Talc
LN006198

Johns (1959) states a bulldozer cut exposed a talc vein five- to six-feet wide for 20 feet, and another cut was from 15 to 20 ft wide for 30 ft.

Unnamed Uranium
LN005734

There were no references found for this site, and the location was inaccurate.

Waylett Group
LN006022

The Waylett mine was not located even though the general area was walked, and the area where the mine symbol on the map is located was searched. No signs of recent exploration was found when the area was visited on 07/1998.

These tungsten claims were first prospected in 1905 (Johns, 1970) and the area was the target of continued exploration in the 1950's. Johns reported that there was an inclined shaft but most of the exploration and development work was by trenching. The mineralization was scheelite in quartz hosted by Wallace Formation.

Waylett North Prospects
LN008518

These prospects are on the Barren Peak 7.5-min. quadrangle to the north of the Waylett mine. A separate entry was created for them. The prospects are just that–prospects. There is one 20-ft highwall but the remainder of the workings are bulldozer scrapes. The trail down to the prospects is closed and is overgrown with alders.

Wayup
LN005946

This site was described as having three adits in Gibson (1948) but four were located upon inspection, all either partially or completely open with discharges from them. The water in the drainage here cascades down the steep slope, and it couldn't be determined if the water coming from the adit was actually formation water or just surface water which had percolated down and was running out of the portal.

Again according to Gibson (1948), the adits were driven on a shear zone with the Prichard Formation to the west of the shear and the Ravalli sandstone east of the shear. The ore itself was reported to be in quartz veins in the shear zone, and ore minerals included galena and pyrite. No buildings are present. No upstream or downstream water samples could be taken because up stream of the mine private land extends almost to the ridgetop and down from the mine the discharge infiltrates into the talus slope before it reaches the drainage on public land.

Weyerhauser
LN005574

Gibson (1948) states, the Weyerhauser prospect is located in the northwest quarter of section 5 on the western slope of Preacher Mountain. The development work includes several open cuts and a 270-ft long adit (Gibson, 1948).

Williams
LN005950

A general description in Gibson (1948, p. 92) is as follows. He states the group of seven claims is in the vicinity of Twin Peaks and Great Northern Mountain, but he does not describe exactly where the workings are. The workings are described as short adits and open cuts; the longest adit was described as 200-ft long.

The prospects were visited 08/19/98; no environmental problems were noted. Numerous open cuts exploring a quartz vein along the ridge were found. An open adit on the far side of the ridge was reported to have been recently worked by G.E. Shaw (B. Lacklen, KNF, 1998) but it was not located.

<u>Wolf Creek Placer</u>
LN006094

This site was screened out because it was a placer and most of the land surrounding Wolf Creek.

<u>Wollastonite Veins</u>
LN006130

This site was described in Johns (1960) as being two wollastonite veins on the south side of Kennedy Gulch. The site was screened out because of the commodity and because of the inaccurate location.

<u>Woods Mine</u>
LN004189

This site was screened out because it had an accuracy in the MILS data base of +/-1 km with no access (roads or trails) on the topographic map. It also had no references to it in literature, and its commodities were lead, zinc, silver and diatomite.

<u>Yaak Falls</u>
LN006146

The site as described in Johns (1959) was visited but no adit was located 100 feet west of Yaak road at Yaak Falls. Johns (1959) described the workings as a 150-ft adit along the strike of a quartz and galena vein in Ravalli quartzite or quartzitic argillite. It was accessible in 1959 but may have been obliterated during road construction. This study was unable to locate it.

<u>Zonolite Mine</u>
LN004297

This site was screened out because the accuracy was +/-5 km, and was a non-metallic vermiculite mine. This site is probably a duplicate of the Vermiculite Mountain mine.

<u>Zollars</u>
LN004159

This site was screened out because it had no references listed in the MILS data base. Johns (1970) listed Walter C. Zollars of Libby as owner of three unpatented claims of the St. Paul Group. This may be the same mine.

**Kootenai National Forest - Sanders County**

<u>Ajax Placer</u>
SA005253

No references were listed in the MILS database for this placer and it was not mentioned in Lyden (1948). It is mentioned in Johns (1970, MBMG Bulletin 79). Johns states that this locality averages $1.00 a yard in 1961 from an area 100 ft by 400 ft. A fairly recent placer operation was noted in the general vicinity of where MILS listed this occurrence, but we were not 100% sure that this was the same deposit. A small old wash plant was in place and had been used fairly recently. A ore bin with sluice was also present.

<u>Amazon Property</u>
SA001320

This mine and the Red Fir claims may be synonymous. Crowley (1963) lists it as developed by shallow surface pits but one open adit (no timbers) with a crosscut was found. It had no discharge. Massive, dark brown limonitic-stained rocks were scattered on the old mining roads. Crowley stated that this mine was hosted by the Ravalli Formation and ore minerals included chalcopyrite and tetrahedrite which was confirmed by the field visit. Access was by hiking the old mining roads from the road up Big Eddy Creek.

<u>Bee and Boo Claim Group</u>
SA004753

There are no references for this occurrence in the MILS data base. It is listed as a copper prospect with a location accuracy of +/-500 meters. It was screened out.

<u>Brende Property</u>
SA001296

Quote from Crowley, F.A., 1963, MBMG Bulletin 34, p. 50 .... "In the 1930's, the unpatented claims were relocated by H.O. Brende of Clark Fork, Idaho, and additional development work was done." This was the only published reference to Brende so it was assumed that the Brende and Copper Ridge properties were the same.

<u>Bonanza Gold Mine</u>
SA005263

The MILS database did not list any references for this occurrence. It was screened out because of the lack of any reference and the poor accuracy (+/-1 km).

<u>Clark Fork Placer</u>
SA005223

The reference of this occurrence is Lyden, 1948 who states that it is an area downstream of the confluence of Trout Creek and the Clark Fork of the Columbia River. The area is private, the location is inaccurate, this is a placer and it was flooded by the dams on the Clark Fork River and so the site was screened out.

Copper Ridge
SA005413

Crowley (1963) quotes Sahinen (1949) saying that development here consisted of five adits and one inclined shaft. Access was gained by walking the four mile Canyon Creek pack trail from the trail head on the Vermilion River road. The site is also known as the Brende Property. It presently consists of numerous (at least five) caved adits and one partly open adit (shaft?) with steep sides. The site is very remote and access is difficult. The mill associated with this site is listed under a separate entry in the database. The site was dry.

Copper Ridge Mill
SA008388

Quote from Crowley, F.A., 1963, MBMG Bulletin 34, p. 50 .... " During the early 1880's the prospect was discovered and a mill was constructed about a half a mile below the main workings. The mill burned but was rebuilt in 1897 as a stamp mill." Milky white quartz vein with minor pyrite and chalcopyrite crystals remained at the mill site. It appeared as if (and is reasonable to assume) that the ore was very selectively milled because of the distance and difficulty of transportation from the Copper Ridge adits. A foundation remains as well as two halves of an iron tank (spiral classifier?) and a large piece of an iron Chilean mill. No tailings were noted in the creek and no effect of milling was noted in the vegetation. No remains of a stamp mill were noted.

Duplex (Sugar Queen)
LN004532

Johns (1970) listed the Duplex as consisting of two, 200-foot long adits and a winze. The winze was flooded at the time of John's visit. The mine explored a vein in a metadiorite sill in the Prichard Formation. The quartz-calcite vein contained galena, sphalerite, chalcopyrite, and pyrite. Dahlem (1959) described the geology of the Dulpex mine area. The mine is hosted by a sill on the SW-side of the Leonia fault. It was primarily a lead-zinc producer although not a large one (100 tons of ore). The ore minerals were bornite and chalcopyrite.

Fredrick and Wind Group
SA001356

This group referred to as the "Fredrick Group" in MBMG Bulletin 95, p. 23 is only located by T27N, R34W in the Squaw Peak district. Its status was listed as "developing" and the commodity was listed as silver and copper. The owner-operators were listed as Lynn Keith and Art Neils of Troy, Montana.

Four Up Group
SA001350

Summary from Lawson, D.C., 1975, MBMG Bulletin 95, p. 23 ..... Owner: Donald C. Cripe and others, Libby, MT. Operator: Hillside Mines, Inc., Spokane, WA. Status: Developing. Commodity: Copper. .... No other information found so this prospect was screened out.

Freeman Prospect

SA005048

Ravalli Formation hosted the quartz-chalcopyrite-bornite, malachite, and limonite veins at the Freeman prospect (Crowley, 1963). According to the USGS, the occurrence is approximately one mile from the end of the Copper Peak road. The field crew of MBMG was unable to locate the occurrence.

Gold King Prospect

SA005273

The site visit here revealed two trenches. One was immediately north of the Elk Mountain pack trail in a clear-cut. The other trench was located in a clearing approximately ¼-mile north of the first trench. The rocks consisted of glacial debris and iron-stained quartzite. No problems were noted.

Golden Rock Mines

SA001362

Only one reference to this mine was listed in the MILS data base. MBMG Bulletin 95 listed this mine as being owned by Golden Rock Mines, Inc. of Wallace, Idaho, a gold, silver, lead, copper prospect and was inactive in 1974. Only the township and range was listed; no section was noted. The site was screened out for these reasons.

Gopherhole Mine

SA005033

This mine was listed as developing in MBMG Bulletin 95 (1975) and was owned by J.C. Brooks of Clark Fork, Idaho and Dettwiler Brothers, Noxon, Montana. A prospect was found where the location plotted on the topographic map, and it was assumed that this was the correct location. The rock was slightly iron-stained argillite with few or no sulfides. The prospect was 6 ft by 8 ft by 10 ft, and was high and dry on a hillside.

Homestead Mining Claims

SA005318

These claims were described in MBMG Memoirs 15, 20 and 30. They included unpatented claims of Ross, Homestead, Harold and Bob and were active in 1939 with 325 ft of development work and in 1948 expanding to 475 ft of drifts. Crowley (1963) stated that the Homestead Mining Company and the Holliday mine were the same property. The Homestead Mining Company evidently never showed any production–just development work.

Laura Apex Group

SA005168

The only references to this mine is in Lawson, 1975, MBMG Bulletin 95 which states that it is in section 12, T24N, R29W, owned by Donald C. Cripe and others, Libby, Montana, a copper prospect who's status was "developing" in 1975. No other reference could be found. No evidence of mining activity could be found.

Lucky Luke
SA005143

There were not any tailings and there was not a mill at the site. There are no discharging adits located at the Lucky Luke site. There were no hazardous materials or structures associated with the site.

According to Crowley (1963), the mine is located four miles north of Belknap, but a USGS topographic map shows a Lucky Luke mine located about four miles west of Belknap. There were no other references listed for this site.

Miller
SA005053

According to Crowley (1963), the Miller prospect is located on Pilgrim Creek road three miles southwest of Noxon. Development work includes two adits, and both are caved at the portal. It is estimated from the size of the dumps that each of the adits were approximately 700 ft long. The dumps contained quartz, chalcopyrite, copper pitch, and pyrite.

Monia Sales Prospect
SA001278

F.A. Crowley (1963) described this prospect and stated that it had a copper-precipitating plant. It was not visited during the summer of 1997 because it lies in the Lolo National Forest and is also on five patented claims.

Razorback
SA004743

This site was screened out in the office because it had an accuracy of +/-1 km, and the only reference in MILS was a USBM production file.

Red Fir Claims
SA005183

The only reference to this location was in MBMG Bulletin 95, which stated that it was inactive in 1974. The reference listed the operator as International Minerals and Chemical Corp., of Skokie, Illinois and the owner as J.C. Brooks of Clark Fork, Idaho. A field visit revealed unpatented claim location notices, one open adit (considered to be the Amazon mine), and two prospects higher on the hill. All were dry.

Rock Creek
SA005288

This occurrence is found in the USGS Bulletin 1501, it is plotted on the map of mineral localities but no further mention of it appears in the text. This site was screened because it is assumed that it is only a prospect.

Ruth V

SA005408

According to Crowley (1963), the Ruth V patented claim is located in section 24, T24N, R32W, on Trout Creek. There is several caved adits and the dumps indicate that there was a large amount of development work. A sample of iron-stained quartz from the dumps assayed a trace of gold, 0.2 ounce silver per ton, 0.3 percent lead, trace of zinc, trace of copper, and 76.2 percent silica.

Ryan

SA004758

This occurrence was screened out because it was listed in T27N, R34W, sections 22, 23, 14, 15; the location was inaccurate. There were no references for it in MILS.

Shoestring

SA004748

The Shoestring mine is located on mixed private and National Forest land. It is unlikely that there will be any impact on the National Forest due to this site. There is no mill site nor any tailings located at the site. There are not any discharging adit, hazardous structures, or hazardous materials associated with the site.

Sid Claim

SA005188

Summary from Lawson, D.C., 1975, MBMG Bulletin 95, p. 24 ..... "Status: developing. Commodity: copper. Owner-operator: Sidney deBarathy, 2900 Sherman, Butte, MT 59701." No other information; no other references so this was screened out.

Sims Gulch Placer

SA005283

There were not any references listed for this site. There was a report of two placer miners killed in a cave-in of an 86-foot shaft in Sims Gulch approximately 2.5 miles above the Vermilion River. A quart bottle filled with gold and two to three pounds of gold in the sluice was reportedly found. This occurrence was never confirmed. A lode mine at the head of Sims Gulch was described in Johns (1970) and is a separate entry in this data base.

Sims Prospect

SA008390

According to Johns (1970), the Sims Prospect is located 2.5 miles east of Silver Butte Pass. It is near the divide between Sims Creek and Waloven Creek. Development work includes a 100-ft adit, a caved adit, and a trench. A grab sample assayed 2.85% copper, 2.25 ounces of silver and 0.003 ounces of gold per ton.

St. Paul Pass Prospect
SA004663

This location is described in the USGS Bulletin 1501 (Cabinet Mountains, Montana) as consisting of a 20-foot adit and two prospect pits. It was not visited because of its remote location and the small chance of any discharge. It was located between the Burke Formation to the west and the Wallace Formation to the east. The occurrence was associated with the Rock Lake fault, in pods and lenses of quartz veins. A chip sample by the USGS assayed 0.1 opt Au, 5.0 opt Ag, and 0.45% Cu.

Trout Creek Placer
SA005218

According to Lyden (MBMG Memoir 26, p. 135), Trout Creek is a northeastward flowing tributary of the Clark Fork of the Columbia River. In 1914, two operators were able to recover $747 in gold and at the turn of the century placer claims on Granite Creek were paying well. It was reported that a small amount of placer mining has been done just below the confluence of the East and West Forks of Trout Creek. There has been no reports of lode mining within the drainage basin of Trout Creek.

Ulley (Squaw Peak)
SA005238

This mine was screened out because of the inaccurate location listed in MBMG Bulletin 34 (one half mile northeast of the Squaw Peak lookout station). There was no production listed for the Ulley, and in 1960, only a few feet of the inclined shaft was accessible. Crowley (1963) reported that the prospect was worked in the 1930's by Dixie Queen Mining Company who drove two crosscut adits and the inclined shaft. Mineralization at the Ulley included quartz, magnetite, chalcopyrite, hematite, limonite and malachite (Crowley, 1963).

Unnamed Copper
SA005398

This site was screened out because of an inaccurate location and because there were no references in MILS. The general area was visited, but no site visit was made.

Upper Heidelberg
SA008389

The Upper Heidelberg is located near Rock Lake (Crowley, 1963). This site is near the Heidelberg site, but there are not any problems associated with this site. There is no mill site or tailings present. There are also no discharging adits located at the upper Heidelberg. One old compressor sat outside the largest adit and some mining equipment had been thrown over the bank.

Vermilion Creek Placer
SA005228

This general description could apply to several of the placers along the Vermilion River. The area shows no sign of large-scale placering; only small recent work was observed. The Vermilion

River has flooded many times in the past, probably erasing any sign of past placering.

Vermilion Mill Site
SA008402

The Vermilion Mill site is located in section 27, T25N, and R30W. The ownership of the land is unknown. Section 27 may have been involved in a checker-board trade. It is not likely that the site would have any impact on National Forest resources. The site was visited in 1998 when the mill was located near the end of the fairly recent logging road (to the east just before the road becomes impassable as it crosses the creek. The mill was in total ruins, and no tailings could be found along the creek. Only cobbles were noted in the area.

Vermilion Mine/Carpenter
SA005418

Two attempts were made to find this mine in 1997 but it was too late in the year (October) to make a serious effort. The Cabinet Divide trail (360) was walked up the Libby side and no workings were noted. The road up Lyons Gulch on the Vermilion side was no longer usable. Johns (1970) describes the property as consisting of a lower mill site and the workings approximately one mile north of the mill site. The mine and mill were located in the summer of 1998. The mill was on the east side of the creek near the end of the recent logging road. It was entirely collapsed. The older mining road was impassable for vehicles but was walked up to the adits. Two adits are totally collapsed on the lower portion and two other adits were located by following the overgrown road to the north. The upper adits were also collapsed with one showing evidence of a small discharge but was not discharging at the time of this visit. Evidence was seen of fairly recent exploration.

Wanless Lake Prospect
SA008517

This prospect is in the Cabinet Mountains Wilderness on the Goat Peak Trail (Banister et al., 1981). The working consists of a small pit dug on the Rock Lake fault zone with Prichard and Burke formations offset by the fault.

Waylett Placer
SA001284

The MILS data base listed no references for this location.  It is mentioned in Johns (1970, MBMG Bulletin 79, p. 84).  This paragraph states that is was on "lower Lyons Creek";  it may be on private ground. They locate it in Lyons Gulch north of the Vermilion River. Lyden (1948) did not mention this deposit by name but does discuss the placers in the area in general. The road along the entire length of the Vermilion River was driven and several placers noted but none of them was identified as the Waylett. This site was screened out because it was a placer and because of the inaccurate location.

White Star / Baker
SA005063

The White Star site is located on KNF-administered land. There was not a mill site or any tailings located at the site. No hazardous structures or materials nor any discharging adits were associated with the site. Two portals can be seen on Pilgrim Creek from the main road (southeast of the Holiday road) (Crowley, 1963). The adits are 95-ft and 340-ft long.

# Appendix IV
# Soil and Water

## Analytical Results
## Kootenai National Forest

Appendix IV. Soil sample results.

| Mine and Sample | Lab ID | Ag mg/Kg | C | Q | As mg/Kg | C | Q | Ba mg/Kg | C | Q | Cd mg/Kg | C | Q | Cr mg/Kg | C | Q | Cu mg/Kg | C | Q | Ni mg/Kg | C | Q | Pb mg/Kg | C | Q | Zn mg/Kg | C | Q | Hg mg/K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambassador | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GAMD10H | 98S0057 | 2.17 | U | | 13.4 | B | * | 140 | B | | 4.63 | B | | 4.34 | U | | 87.2 | | | 5.74 | B | | 506 | | * | 605 | | * | 1.625 |
| Blue Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BBCD10H | 98S0075 | 7.02 | B | | 1000 | | * | 9.82 | B | | 36.6 | | * | 13.5 | B | N | 307 | | | 18.6 | B | | 5274 | | | 10930 | | | 1.645 |
| Cherry Creek Millsite | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCHT10H | 99S0078 | 12.364 | | | 1784.2 | | | 11.863 | | | 2.398 | | | 2.455 | | | 248.439 | | * | 0.864 | | B | 11506.06 | | * | 1672.817 | | | |
| CCHT20H | 99S0077 | 1.243 | | B | 41.19 | | | 122.877 | | B | 3.251 | | | 4.206 | | | 32.84 | | * | 3.226 | | B | 1366.828 | | * | 758.781 | | | |
| Heidelberg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RHED10H | 98S0074 | 2.09 | U | | 3.28 | B | * | 25.4 | B | | 0.42 | U | * | 4.18 | U | N | 25.6 | B | | 8.33 | B | | 16.9 | | | 44.3 | | | 1.044 |
| Holliday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PHOD10H | 98S0056 | 2.16 | U | | 9.48 | B | * | 91.8 | B | | 4.33 | U | | 4.33 | U | | 8.7 | B | | 7.13 | B | | 12.2 | | * | 104 | | * | 1.082 |
| Iron Mask | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KIMD10H | 98S0076 | 2.44 | U | | 3121 | | * | 82.3 | B | | 59.6 | | * | 15.1 | B | N | 56.5 | B | | 26.9 | B | | 1489 | | | 1981 | | | 1.218 |
| Silver Mountain | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GSMW10H | 99S0076 | 2.646 | | | 1433.9 | | | 42.461 | | | 3.137 | | | 3.199 | | | 31.639 | | * | 4.927 | | B | 827.88 | | * | 314.091 | | | |
| Snowshoe Mine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSND10H | 99S0023 | 27.482 | | | 5515.8 | | | 4.356 | | B | 90.41 | | | 1.013 | | B | 328.555 | | * | 3.544 | | B | 10872.1 | | * | 9315.079 | | | |
| SSND20H | 99S0022 | 2.087 | | B | 56.069 | | | 132.777 | | | 11.189 | | | 2.824 | | | 11.801 | | * | 2.581 | | B | 686.782 | | * | 1045.09 | | | |
| Vermilion River Adit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VVRD10H | 98S0058 | 2.18 | U | | 14.2 | B | * | 79.5 | B | | 4.37 | U | | 6.56 | B | | 26.2 | B | | 15.4 | B | | 43.5 | | * | 69.2 | | * | <.546 |
| Victor-Empire | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GEVW10H | 99S0075 | <.202 | | U | 493.25 | | | 67.89 | | | 1.562 | | | 5.823 | | | 11.562 | | * | 6.905 | | B | 67.676 | | * | 227.813 | | | |

B - Detected but below method detection limit.

U - Analyzed for but below instrument detection limit.

N - Spike samplerecovery not within control limits.

* - Duplicate sample not within control limits.

ICP - Outside of calibrated range of ICP

Appendix IV. Water-quality chemistry.

| Bottle | | Al | As | Ba | Cd | Cr | Cu | Fe | Pb | Mn | Hg | Ni | Ag | Zn | Cl | F | NO3_n | SO4 | SiO2 | field_ph | field_sc | lab_sc | lab_ph | redox | Disch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | mg/L | ug/L | mg/L | ug/L | ug/L | ug/L | ug/L | mg/L | mg/L | mg/L | mg/L | mg/L | | umhos/cm | | | | gpm |
| **Ambassador - sample date 08/27/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| GAMS30H | adit | <30. | 1.4 | 35.5 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | 4.1 | <1. | 100.8 | <.05 | -- | <.05 | 42.2 | 22.6 | 7.54 | 226 | 246 | 8.08 | | 5 |
| GAMS10L | upstream | <30. | <2. | 29.2 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 9 | <.5 | -- | <.05 | 4.3 | 12.9 | 6.88 | 22 | 26 | 7.09 | | 673.2 |
| GAMS20L | downstream | <30. | <2. | 33.6 | <2. | <2. | <2. | <.003 | <100. | <.002 | <.1 | <2. | <1. | 13 | <5. | -- | <.05 | 5.9 | 13 | 6.95 | 31 | 36 | 7.08 | | 673.2 |
| **Blue Creek - sample date 09/10/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| BBCS30L | adit | <30. | <1. | 30.2 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 9.6 | <.5 | <.05 | 0.19 | 2.6 | 6.5 | 7.09 | 21 | 27 | 7.68 | | 20 |
| BBCS40L | seep | <30. | <1. | 16.1 | <2. | <2. | <2. | <.003 | 14.4 C | <.002 | <.1 | <2. | <1. | 11.8 | <.5 | <.05 | 0.13 | <2.5 | 6.4 | 6.63 | -- | 39 | 7.85 | | 20 |
| BBCS20L | upstream | <30. | <1. | 26.2 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 4.7 | <.5 | <.05 | 0.05 | <2.5 | 5.5 | 7.62 | 63 | 69 | 8.38 | | 897.6 |
| BBCS10L | downstream | <30. | <1. | 22.8 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 6.9 | <.5 | <.05 | 0.06 | <2.5 | 5.5 | 7.44 | 58 | 67 | 8.37 | | 897.6 |
| **Bramlet Creek - sample date 07/31/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| BBRS10L | upstream | 19.2 | <1. | 25.11 | <2. | <2. | 2.27 | 0.086 | <2. | 0.008 | <1 | <2. | <1. | 11.7 | <.5 | <.05 | 0.093 | <2.5 | 4.98 | 5.94 S | 10 | 12.6 | 5.95 S | | 75 |
| BBRS20L | downstream | <15. | <1. | 20.77 | <2. | <2. | <2. | 0.006 | <2. | 0.001 | <1 | <2. | <1. | 6.51 | <.5 | <.05 | 0.059 | 3.332 | 6.32 | 7.25 | 20 | 21.1 | 7.2 | | 400 |
| **Broken Hill - sample date 09/11/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| BBHS10M | adit | <30. | 30.7 | 13.8 | <2. | <2. | <2. | <.003 | <2. | 0.005 | <.1 | <2. | <1. | 515 A C | <.5 | <.05 | 0.06 | 3.79 | 6.6 | 6.51 | 80 | 61 | 8.36 | | 20 |
| **Cherry Creek Millsite - sample date 09/03/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CCHS20L | upstream | <15 | 3.01 | 19.41 | <2 | <2 | <2 | <.007 | <2 | <.001 | <1 | <2 | <1 | 63.63 | <.5 | <.05 | 0.109 | 3.955 | 5.5 | 7.55 | 84 | 94 | 7.62 | | 2876 |
| CCHS10L | downstream | <15 | 3.2 | 27.03 | <2 | <2 | <2 | <.007 | <2 | <.001 | <1 | <2 | <1 | 64.57 | <.5 | <.05 | 0.11 | 3.96 | 5.4 | 7.6 | 84 | 93 | 7.46 | | 2876 |
| **Copper Reward/Walker Tunnel - sample date 09/02/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CWTS10L | adit | <15 | 16.21 | 18.04 | <2 | <2 | <2 | 0.016 | <2 | 0.007 | <1 | <2 | <1 | 18.2 | 0.718 | <.05 | <.05 | 4.478 | 8.1 | 6.82 | 91 | 97 | 6.97 | | 2 |
| CWTS20L | adit-dup | <15 | 16.49 | 6.8 | <2 | <2 | <2 | 0.015 | <2 | 0.008 | <1 | <2 | <1 | 8.73 | 0.906 | <.05 | <.05 | 4.749 | 8.2 | 6.82 | 91 | 96 | 7.11 | | 2 |
| **Giant Sunrise - sample date 10/02/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CGSS10M | adit | <15. | 2.4 | 15.3 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <5. | <1. | 41.5 | 1.38 | 0.06 | 0.21 | 4.22 | 9.9 | 7.24 | 149 | 170 | 8.56 S | | 0.2 |
| CCSS20M | downstream | <15. | 2.8 | 13.2 | <2. | <2. | <2. | <.005 | 3.7 C | <.001 | -- | 3.4 | <1. | 32.2 | <.5 | <.05 | <.05 | 11.5 | 10.6 | 6.2 S | 121 | 122 | 7.52 | | 1 |
| **Gloria - sample date 10/15/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| FGLS10L | adit | 96.1 S C | <1. | 13.1 | <2. | <2. | 10.5 | 0.039 | <2. | 0.05 S | <1. | 2.29 | <1. | <15. | 0.61 | <.05 | <.05 | 4.85 | 4.6 | 6.01 S | 17 | 19 | 6.13 S | | 1 |
| FGLS30L | upstream | <15. | <1. | 10.9 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1. | <2. | <1. | <15. | 0.54 | <.05 | 0.05 | <2.5 | 4.4 | 6.99 | 12 | 14 | 7.28 | | 15 |
| FGLS20L | downstream | <15. | <1. | 9.9 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1. | <2. | <1. | <15. | 0.54 | <.05 | 0.09 | 2.64 | 4.25 | 6.98 | 10 | 13 | 7.04 | | 15 |
| **Goat Creek Adit - sample date 10/02/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| GGMS10L | upstream | <15. | <1. | 9.7 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <2. | <1. | 2.7 | <.5 | <.05 | <.05 | 2.87 | 11.7 | 6.24 S | 26 | 32 | 7.86 | | 898 |
| GGMS20L | downstream | <15. | <1. | 10.6 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <2. | <1. | <2. | <.5 | <.05 | <.05 | 3.7 | 11.6 | 6.6 | 27 | 33 | 7.87 | | 898 |
| **Granite & Silver Mountain mines - sample date 08/12/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| GSMS10H | adit | <15 | 30.35 | 16.2 | <2 | <2 | <2 | <.005 | <2 | 0.001 | <1 | 3.07 | <1 | 69.61 | <.5 | 0.07 | <.05 | 28.88 | 9.136 | 7.9 | 230 | 230 | 7.61 | | 3 |
| GEVS20L | upstream | <15. | <1. | 18.52 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1 | <2. | <1. | 3.12 | <.5 | <.05 | 0.105 | 3.237 | 4.1 | 7.88 | 46.4 | 51.8 | 7.3 | | 4488 |
| GEVS30L | downstream | <15. | <1. | 26.84 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1 | <2. | <1. | 3.09 | <.5 | <.05 | 0.111 | 3.24 | 4.045 | 7.72 | 46.8 | 54 | 7.48 | | 4488 |
| **Grouse Mountain - sample date 10/01/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CGMS10L | upstream | <15. | 9.7 | 7.1 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | 2.9 | <1. | 3.5 | <.5 | <.05 | <.05 | 2.78 | 12.4 | 7.63 | 93 | 101 | 8.32 | | 3 |
| CGMS20M | downstream | <15. | 35.4 | 14.1 | 2.1 C | <2. | <2. | 0.006 | <2. | <.001 | -- | 3.4 | <1. | 145.1 A C | <.5 | <.05 | <.05 | 5.92 | 11.343 | 6.6 | 27 | 113 | 8.27 | | 3 |
| **Heidelberg - sample date 09/09/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| RHES10L | adit | <30. | <1. | 22 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 6.1 | <.5 | <.05 | 0.07 | 2.62 | 6.7 | 7.86 | 32 | 42 | 8.1 | | 300 |
| RHES40L | seep | <30. | <1. | 15.2 | <2. | <2. | 2.2 | <.003 | <2. | 0.017 | <.1 | <2. | <1. | 7.5 | <.5 | <.05 | 0.05 | <2.5 | 5.9 | 7.54 | 31 | 36 | 8.08 | | 300 |
| RHES20L | upstream | <30. | <1. | 20.1 | <2. | <2. | <2. | <.005 | <2. | <.001 | <.1 | <2. | <1. | 7 | <.5 | <.05 | <.05 | <2.5 | 1.25 | 7.28 | 6 | 9 | 7.44 | | 808 |
| RHES30L | downstream | <30. | <1. | 15 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 2.5 | <.5 | <.05 | <.05 | <2.5 | 2.2 | 7.27 | 10 | 15 | 7.7 | | 808 |

| Bottle Number | | Al ug/L | As ug/L | Ba ug/L | Cd ug/L | Cr ug/L | Cu ug/L | Fe mg/L | Pb ug/L | Mn mg/L | Hg ug/L | Ni ug/L | Ag ug/L | Zn ug/L | Cl mg/L | F mg/L | NO3_n mg/L | SO4 mg/L | SiO2 mg/L | field_ph | field_sc umhos/cm | lab_sc umhos/cm | lab_ph | redox | Disch. gpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Holliday - sample date 08/28/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| PHOS50L | lower adit | <30. | 2.7 | 41.3 | <2. | <2. | <2. | 0.008 | <2. | 0.01 | <.1 | <2. | <1. | 29.7 | <.5 | -- | <.05 | 3.6 | 16.2 | 5.94 S | 90 | 101 | 7.47 | | 8 |
| PHOS20H | upper adit | <30. | <2. | 65.8 | <2. | <2. | <2. | <.005 | <2. | <.001 | <.1 | <2. | <1. | 52.9 | <.5 | -- | <.05 | 9.3 | 5.68 | 7.67 | 257 | 293 | 8.26 | | 8 |
| PHOS10L | upstream | <30. | <2. | 15.4 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 4.9 | <.5 | -- | <.05 | <2.5 | 9.7 | 6.33 S | 35 | 44 | 7.57 | | 60 |
| PHOS40L | downstream | <30. | <1. | 18.6 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 4.7 | <.5 | -- | <.05 | 2.1 | 10.8 | 7.59 | 34 | 39 | 7.49 | | 673 |
| **Iron Mask - sample date 10/01/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| KIMS10H | 10/01/97 | <15. | 140.8 P | 8.8 | <2. | <2. | <2. | <.005 | <2. | 0.005 | -- | 7.4 | <1. | 12.2 | 1.08 | 0.07 | <.05 | 18.77 | 15.2 | 7.41 | 211 | 219 | 8.46 | | 0.5 |
| **Jack Waite - sample date 09/10/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| DJWS10L | upstream | <30 | <1. | 19 | <2. | <2. | <2. | <.003 | <2 | <.002 | <.1 | <2. | <1. | 7.6 | <.5 | <.05 | <.05 | 7.87 | 8.4 | 6.51 | 40.3 | 44 | 7.27 | | 7 |
| DJWS20L | downstream | <30 | <1. | 26.4 | <2 | <2. | <2. | <.003 | 69.9 P A C | <.002 | <.1 | 2 | <1. | 77.2 | <.5 | <.05 | <.05 | 24.2 | 8.8 | 7.06 | 139.1 | 151 | 7.8 | | 25 |
| **King - sample date 08/18/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SKIS10L | downstream | <15 | 2.42 | 12.64 | <2 | <2 | <2 | <.005 | <2 | <.001 | <1 | <2 | <1 | 50.09 | <.50 | <.05 | <.05 | 4.502 | 10.27 | 7.97 | 19 | 25 | 7.11 | 525 | 20 |
| **Independence - sample date 09/30/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| IINS10M | adit | <30 | <1. | 108 | <2 | <2 | 16.9 C | <.005 | <2 | <.001 | - | 3 | <1 | 5.14 | <.5 | <.05 | <.05 | 7.591 | 4.64 | 7.97 | 185 | 209 | 7.89 | | 1 |
| ILSS10M | spring | <30 | <1. | 174 | <2 | <2 | <2 | <.005 | <2. | <.001 | - | <2. | <1. | 12.9 | <.5 | <.05 | 0.062 | 2.607 | 4.19 | 8.32 | 109 | 121.8 | 7.41 | | 70 |
| **Lukens, Loyal, and Shaughnessy - sample date 09/01/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| HLOS10H | adit | 149.5 S C | 7.73 | 15.23 | <2 | 3.4 | <2 | 0.009 | <2 | 0.008 | <1 | 4.7 | <1 | 2.7 | 0.516 | 0.074 | <.05 | 17.5 | 7.2 | 7.76 | 369 | 383 | 7.74 | | <1 |
| SSCS10M | adit | <15 | 3.58 | 70.63 | <2 | <2 | <2 | 0.136 | <2 | 0.097 S | <1 | 7.66 | <1 | 34.51 | 3.596 | 0.198 | <.05 | 36.05 | 21.4 | 6.69 | 164 | 211 | 6.41 S | | <1 |
| SLHS20M | upstream | <15 | 3.78 | 28.66 | <2 | <2 | <2 | <.007 | <2 | <.001 | <1 | <2 | <1 | 5.87 | <.5 | <.05 | <.05 | 5.414 | 11.2 | 7.79 | 125 | 138 | 7.76 | | 40 |
| SLHS10H | downstream | <15 | 3.87 | 27.6 | <2 | <2 | <2 | <.007 | 3.37 C | <.001 | <1 | 3.72 | <1 | 75.88 | <.50 | 0.096 | <.05 | 44.89 | 13.3 | 8.09 | 277 | 284 | 7.8 | | 43 |
| **Nancy Jane - sample date 08/14/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| BNJS10M | adit | <30. | <2. | 106.9 | <2. | 2.8 | <2. | <.003 | <2. | <.002 | -- | 2.6 | <2. | <2. | <.5 | -- | <.05 | 3.5 | 3.9 | 7.52 | 121 | 131 | 7.57 | | 1 |
| **Pilgrim - sample date 08/28/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| PPIS10L | adit | <30. | 5.7 | 22.9 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | <2. | <.5 | -- | 0.06 | 3.1 | 10.1 | 6.9 | 69 | 82 | 7.85 | | 20 |
| PPIS20L | upstream | <30. | <1. | 19.2 | <2. | <2. | <2. | <.003 | <2. | 0.006 | | <2. | <1. | 4.4 | <.5 | -- | <.05 | 2.8 | 10 | 7.31 | 64 | 44 | 7.38 | | 224 |
| PPIS30L | downstream | <30. | <1. | 24.7 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | 5.1 | <.5 | -- | <.05 | 2.9 | 10.3 | 7.28 | 51 | 61 | 7.5 | | 448 |
| **Rock Lake - sample date 09/29/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| RRLS10H | adit | <30 | <1. | 295 | <2 | <2 | <2 | 0.008 | <2. | 0.012 | -- | 5.49 | <1 | 7.29 | 1.105 | 0.058 | 0.263 | 4.975 | 13.3 | 7.76 | 441 | 437 | 7.96 | 474 | <1 |
| **Snowfall - sample date 10/30/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSNS10L | adit | <15. | 5.8 | 7.9 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1. | <2. | <1. | 19.4 | <.50 | <.05 | <.05 | 3.54 | 8.1 | 6.63 | 34 | 25 | 7.51 | | 4 |
| SSNS30L | upstream | <15. | 1.5 | 7.3 | <2. | <2. | <2. | 0.008 | <2. | <.001 | <1. | <2. | <1. | 12.4 | <.5 | <.05 | <.05 | 5.4 | 10.2 | 6.06 S | 38 | 37 | 7.53 | | 30 |
| SSNS20L | downstream | <15. | 1.05 | 26.5 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1. | <2. | <1. | 18.5 | <.5 | <.05 | <.05 | 5.7 | 10.8 | 6.63 | 34 | 37 | 7.07 | | 15 |
| **Snowshoe - sample date 07/30/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSNS30L | spring | <15. | <1. | 14.09 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1 | <2. | <1. | 129.4 A C | <.5 | <.05 | 0.163 | 4.675 | 3.484 | 7.39 | 88 | 107.3 | 7.11 | | 15 |
| SSNS10L | upstream | <15. | <1. | 20.4 | <2. | <2. | <2. | 0.052 | <2. | <.001 | <1 | <2. | <1. | 4.22 | <.5 | <.05 | 0.075 | <2.5 | 2.16 | 8.1 | 62 | 66.9 | 7.36 | | 440 |
| SSNS20L | downstream | <15. | 3.68 | 37.66 | 9.75 P A C | <2. | <2. | <.005 | 2.5 | 0.007 | <1 | <2. | <1. | 619.1 A C | <.5 | <.05 | 0.139 | 7.127 | 3.12 | 7.57 | 81 | 87.6 | 7.29 | | 507 |
| **Snowstorm - sample date 09/30/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CSNS30H | adit | <30. | 1.1 | 8.1 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <5. | <1. | 76.1 | 12.68 | 0.6 | 0.1 | 68.13 | 11.1 | 11 S | 331 | 345 | 8.64 S | | 5 |
| CSNS10L | upstream | <15. | <1. | 5.6 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <2. | <1. | 5.9 | -- | -- | -- | -- | 10.4 | 10.38 S | 28 | -- | -- | | 11220 |
| CSNS20L | downstream | <15. | <1. | 5.7 | <2. | <2. | 6.8 | 0.005 | <2. | 0.001 | -- | <2. | <1. | 26 | -- | -- | -- | -- | 10.1 | 7.86 | 28 | -- | -- | | 11220 |
| **Silver Mountain - sample date 08/12/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| GSMS10H | adit | <15. | 30.35 | 16.2 | <2. | <2. | <2. | <.005 | <2. | 0.001 | <1 | 3.07 | <1. | 69.61 | <.5 | 0.07 | <.05 | 28.88 | 9.136 | 7.9 | 230 | 230 | 7.61 | | 3 |

| Bottle Number | | Al ug/L | As ug/L | Ba ug/L | Cd ug/L | Cr ug/L | Cu ug/L | Fe mg/L | Pb ug/L | Mn mg/L | Hg ug/L | Ni ug/L | Ag ug/L | Zn ug/L | Cl mg/L | F mg/L | NO3_n mg/L | SO4 mg/L | SiO2 mg/L | field_ph | field_sc umhos/cm | lab_sc umhos/cm | lab_ph | redox | Disch. gpm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sunrise Mill - sample date 10/01/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| CSMS10L | downstream | <15. | 1.2 | 26.7 | <2. | <2. | <2. | 0.333 S | <2. | 0.01 | -- | <2. | <1. | 12.4 | <.5 | <.05 | <.05 | 4.87 | 12.5 | 7.19 | 57 | 62 | 7.97 | | 449 |
| **Twin Peaks - sample date 08/14/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| BTPS10M | seep | <30. | <2. | 142.5 | <2. | <2. | <2. | <.003 | <2. | <.002 | -- | 2.3 | <2. | <2. | <.5 | -- | <.05 | 5.5 | 3.7 | 8.13 | 103 | 111 | 7.77 | | 2 |
| **Vermiculite Mountain - sample date 08/13/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| RVMS10H | upstream | <15. | 1.445 | 181.72 | <2. | 2.21 | <2. | <.005 | <2. | <.001 | <1 | 6.6 | <1. | 5.14 | 0.715 | 0.108 | <.05 | 5.377 | 19.524 | 8.08 | 386 | 421 | 8.1 | | 100 |
| RVMS20H | downstream | <30. | 2.28 | 330 | <2. | 3.23 | <2. | <.005 | <2. | 0.004 | <1 | 6.9 | <1. | 4.32 | 6.69 | 0.911 | 0.076 | 10.355 | 24.73 | 8.55 S | 465 | 492 | 8.41 | | 600 |
| **Vermilion River Adit - sample date 08/21/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| VVRS10M | adit | <30. | 2.5 | 7.2 | <2. | <2. | <2. | <.003 | <2. | 0.008 | <.1 | 2.8 | <1. | <2. | <.5 | -- | <.05 | 14.5 | 15.7 | 8.08 | 145 | 143 | 7.97 | | 5 |
| VVRS20L | upstream | <30. | <1. | 44.9 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | <2. | <.5 | -- | <.05 | 2.8 | 9.8 | 8.11 | 76 | 78 | 7.8 | | 1800 |
| VVRS30L | downstream | <30. | <1. | 44.7 | <2. | <2. | <2. | <.003 | <2. | <.002 | <.1 | <2. | <1. | <2. | <.5 | -- | <.05 | 2.7 | 9.9 | 8.24 | 78 | 77 | 7.73 | | 1800 |
| **Victor-Empire - sample date 08/12/98** | | | | | | | | | | | | | | | | | | | | | | | | | |
| GEVS10H | adit | <30. | 33.66 | 44.59 | <2. | <2. | <2. | 0.024 | <2. | 0.013 | <1 | 5.304 | <1. | 68.72 | 0.56 | 0.264 | <.05 | 41.37 | 12.24 | 8.01 | 427 | 402 | 8.05 | | 4 |
| GEVS20L | upstream | <15 | <1. | 18.52 | <2 | <2 | <2 | <.005 | <2 | <.001 | <1 | <2 | <1 | 3.12 | <.5 | <.05 | 0.105 | 3.237 | 4.1 | 7.88 | 46.4 | 51.8 | 7.3 | | 4488 |
| GEVS30L | downstream | <15 | <1. | 26.84 | <2 | <2 | <2 | <.005 | <2 | <.001 | <1 | <2 | <1 | 3.09 | <.5 | <.05 | 0.111 | 3.24 | 4.045 | 7.72 | 46.8 | 54 | 7.48 | | 4488 |
| **Viking - sample date 10/28/97** | | | | | | | | | | | | | | | | | | | | | | | | | |
| SVIS10L | adit | <15. | <1. | 19.6 | <2. | <2. | <2. | <.005 | <2. | <.001 | <1. | <2. | <1. | 2.9 | <.5 | <.05 | <.05 | 5.96 | 15 | 6.99 | 95 | 93 | 7.99 | | 2.5 |
| SVIS20L | upstream | <15. | <1. | 221 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <2. | <1. | <2. | <.5 | <.05 | <.05 | 2.655 | 10.8 | 7.37 | 30 | 32 | 7.88 | | 134.6 |
| SVIS30L | downstream | <15. | <1. | 22.7 | <2. | <2. | <2. | <.005 | <2. | <.001 | -- | <2. | <1. | <2. | <.5 | <.05 | -- | <2.684 | 10.8 | 7.34 | 29 | 35 | 7.72 | | 134.6 |