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# **Appendix F**

## **MINERALS**

## APPENDIX F MINERALS

### A. ISSUES, CONCERNS, OPPORTUNITIES

Most of the region's income is derived from agriculture and the timber industry. The considerable undeveloped mineral potential of the region provides a significant employment opportunity. Concern about the possible environmental damage that could occur from mineral development (particularly open-pit or placer mining) has been expressed by the public. Today, mineral developers meet a number of environmental protection laws and restore the land to a usable form upon completion of their operations. Environmental protection is monitored by Federal and State agencies.

The Mining and Minerals Policy Act of 1970 states " . it is the continuing policy of the Federal Government .to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining [and] minerals . industries, [and] (2) the orderly and economic development of domestic mineral resources [and] reserves . to help assure satisfaction of industrial [and] security needs. . " Many support this position based on a desire to maintain a favorable balance of trade, to provide for the national defense, and to support the local economy. Since the economics of mineral extraction is based almost entirely on external factors, there is little the Forest can do to encourage development other than to keep areas of mineral potential open and to make administrative processing of mineral activities as efficient as possible.

A continuing concern of Forest management is mining law compliance. Occupancy of structures on mining claims provides a case in point. Under existing law, the holder of a valid claim may erect structures necessary for mineral development. However, there have been instances of structures being built and occupied on mining claims and being used for purposes unrelated to mining. Abuses of this sort have been greatly reduced in recent years, and the effort is still underway to correct them.

Mineral resources are frequently located in areas which are valued for timber production, recreation, wildlife, and scenery. The axiom that "gold is where you find it" applies to all other minerals as well. As long as there is a demand for minerals, there will be pressure to explore and develop them. As a land managing agency, the Forest Service must make sure adequate surface protection measures are included for the extraction of minerals and subsequent reclamation of National Forest land.

### B. CURRENT SITUATION

#### 1. Locatable Minerals

Locatable mineral deposits on public domain lands may be prospected for and extracted under the 1872 mining law, as amended and supplemented. Administration of the general mining laws is the responsibility of the Bureau of Land Management, within the Department of the Interior. A 1957 memorandum of understanding between the Bureau of Land Management and Forest Service provides for joint administration of the mining laws on National Forest System lands. Regulations covering surface use of the National Forests under the mining laws were promulgated in 1974 to provide for orderly development of locatable mineral resources and for subsequent reclamation of the land.

The Forest is in the heart of the most productive gold and silver region in the state of Oregon. Other metals including copper, chrome, mercury, and cobalt have also been produced in the Forest vicinity. (See discussion in Chapter III of the Environmental Impact Statement.) Both lode and placer mines have made substantial contributions to total production figures. At 1983 prices, northeastern Oregon's historic mineral production would have been worth over \$1.9 billion. Historic metal production from the vicinity of the Forest would be worth \$51 million. (See EIS Chapter III, Section D). There are currently 1,860 mining claims on the Forest.

Although metallic mineralization occurs in several areas across the Forest, the most productive deposits have been found in pre-Tertiary rocks on the margins of Mesozoic granitic intrusives, particularly on the south slope of the Greenhorn Mountains and in the vicinity of Canyon Mountain. The placer gold production from the old Canyon mining district makes that area the largest gold producer in the state.

Most of the mining activity in the area was stopped in 1942 when War Production Board Order L-208 closed all precious metals mines. Increased operating costs and a fixed gold price, together with the substantial expenditures necessary to reactivate mines neglected for several years, prevented the reopening of all but a few precious metals mines after the war. Only recently, with the increase in gold and silver prices, has the area re-emerged as a focus of mining interest. There are currently thousands of lode and placer claims in the mineral belt of northeastern Oregon and western Idaho.

Due to recent gold discoveries and encouraging exploration results, up to 40,000 new mining claims have been staked on the Bureau of Land Management land in southeastern and eastern Oregon. There are areas of similar geology in the southeastern and eastern portions of the Forest and future exploration in these areas is likely.

All lands on the National Forest are open to mining except those areas specifically withdrawn from mineral entry. Also, mineral reservations and outstanding mineral rights exist on some of the land on which the Forest administers the surface resources.

The Wilderness Act of 1964 allowed prospecting for locatable minerals and location of mining claims until December 31, 1983. The passage of that date has withdrawn the Strawberry Mountain Wilderness from mineral entry, and the Oregon Wilderness Act of 1984 has withdrawn considerable additional acreage. Mining claims which predate withdrawal, including those within wilderness, may continue to be worked under the mining laws if they contain a valid discovery of a valuable mineral.

## **2. Leasable Minerals**

**Oil and Gas:** The Forest Service has no statutory responsibility to issue leases or permits on lands reserved from the public domain. The Mineral Leasing Act of 1920 reserves this authority for the Secretary of the Interior. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 provides the Secretary of Agriculture with consent authority for issuance of oil and gas leases on National Forest System lands. This Act also provides that permits to drill on an oil or gas lease will not be granted without the analysis and approval of the responsible Forest Service official. On acquired National Forest System lands, the Mineral Leasing Act for Acquired Lands of 1947 requires consent by the Secretary of Agriculture prior to leasing of the mineral estate.

Western portions of the Forest are within the Columbia Basin of Oregon and Washington. The basin has been recognized for many years to have a potential for oil and gas within or beneath the layers of lava known as the Columbia River Basalt. Exploration has been limited and sporadic due to the hard drilling in, and difficulty of exploring beneath, the basalt. Carbonaceous sediments provide a potential source of oil and gas, and porous volcanics provide suitable reservoirs. Recently, numerous interests including major oil companies, have obtained leases in the vicinity. To date, no drilling has occurred.

Geothermal: Although a few hot springs are known to occur in and near the Forest, there does not presently appear to be a high potential for geothermal resource development. Currently, there are no geothermal leases or lease applications within the Forest boundaries. The U.S. Geological Survey considers some lands prospectively valuable for geothermal resources in the vicinity, some of which partially overlap the Forest boundaries. Should an interest in geothermal exploration develop, the Geothermal Steam Act of 1970 requires that geothermal leasing on National Forest System lands be subject to the consent of and conditions prescribed by the Secretary of Agriculture.

### 3. Mineral Materials

Sand, gravel, crushed rock, building stone, and some limestone occur within the Forest boundaries. These are all low unit-value mineral materials which must be near transportation routes, and usually the point of consumption, to be utilized. The Forest Service may dispose of obviously common varieties of mineral materials such as cinders, building stone used for construction purposes, river rock, and rock or sand to be used for aggregate or road construction.

Table F-1 displays evaluation criteria used to delineate and categorize mineralized areas in the Forest vicinity. New discoveries could change the assessment of potential, as well as identify new areas outside those shown in this assessment.

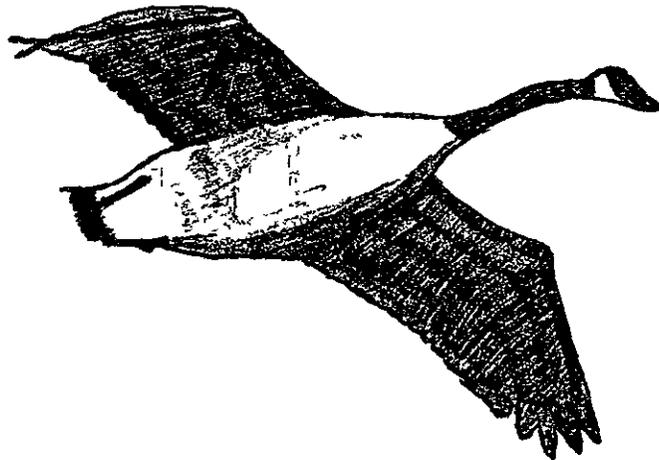


TABLE F-1

## EVALUATION CRITERIA FOR LOCATABLE MINERALS

| CATEGORY  | I  | II  |
|---|--|---|
| 1 Potential for Substantial Development/ Production Within 10 Years | High   | Moderately high   |
| 2. Current Activity Level   | Production or development in progress or pending investment decision.          | Comprehensive exploration, development likely. May include some small-scale production. |
| 3 Land Position   | Long-term maintenance of claims by established mineral companies/ individuals. | Long term.  |
| 4. Geology  | Known and favorable for development of significant ore deposits.               | Known and considered favorable from comparison with other producing districts.          |
| 5 Reserve/Resource  | Ore reserves established. Will sustain significant production.                 | Presence of, or strong potential for, substantial resource May include small reserves.  |

\*Includes all areas not in other categories.

| III  | IV   | V *                                 |
|--|--|-------------------------------------|
| Moderate   | Low  | Very low based on current knowledge |
| Exploration programs which may include sampling, geochemical and geophysical surveys, geologic mapping, reconnaissance drilling<br>May include some hobby-size producers | Sporadic exploration with occasional isolated intense programs by companies or prospectors | Occasional interest by prospectors. |
| Intermittent by established mineral companies/individuals, long term by prospectors  | Short term by established companies/individuals<br>Intermittent by prospectors.            | Sporadic.                           |
| Not well known, but appears to have favorable characteristics.   | Not well known, some favorable characteristics.  | Either unknown or unfavorable       |
| Potential for large resource is unknown<br>Small resources, possibly some very small pockets of reserves   | Some mineral occurrences, but not to establish resources.                                  | Unknown.                            |

**C. DESCRIPTIONS**

Area boundaries were drawn on the basis of information gathered from the references at the end of the text. Factors taken into consideration include the geology, historical production information, available sample data, and present mining claim records derived from Bureau of Land Management files. See Table F-1 for an explanation of the categories. Note that Category V includes "all other" areas, both unknown and unfavorable for mineral deposits. It would be difficult to differentiate these areas on a map, since new discoveries sometimes result in mines being located in areas previously considered unfavorable.

**1. Ben Harrison Peak - Category II**

This area is centered around Ben Harrison Peak in the Greenhorn Mountains and includes parts of the old Greenhorn and Desolation Creek mining districts. Most of the area is north of the Malheur within the Umatilla National Forest. Dominant rock type is Jurassic or Cretaceous quartz diorite and granodiorite. Late Paleozoic and Triassic argillite, gabbro, serpentinite, and serpentinite matrix melange are exposed locally. A few patches of tuffaceous sedimentary rocks and basaltic flows of Tertiary age locally cap the older rocks (Brooks et al., 1983).

Mineralization generally consists of sulfides in northeasterly striking quartz veins, stringers, and breccia zones. Silver is the dominant metal, but gold is also present. Ore minerals include pyrite, arsenopyrite, sphalerite, galena, tetrahedrite, chalcopyrite, molybdenite, stibnite, pyrargyrite, and stephanite (Brooks et al., 1983).

| <u>Mine</u> | <u>Location</u>            | <u>Production</u> | <u>References</u>                            |
|-------------|----------------------------|-------------------|--|
| Morris      | Sec 1, T. 10 S., R. 34 E   | \$48,400          | Brooks and Ramp, 1968<br>Brooks et al., 1983 |
| Silver Bell | Sec. 2, T 10 S., R. 34 E   | \$ 4,000          | Brooks et al., 1983                          |
| Tempest     | Sec. 10, T. 10 S, R. 34 E. | \$10,000          | Brooks et al., 1983;<br>Lindgren, 1901       |
| Total       |                            | <u>\$62,400</u>   |  |

Estimated metal content: 500 oz of gold; 96,000 oz. of silver

The area is currently heavily claimed and has recently been the subject of substantial exploration activity. One mine, the Tempest, is being developed and mined on a small scale. Continued exploration and development of the silver-gold properties in the area can be expected in the near future.

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**2. Black Butte -  
Category IV**

This is a small area located on the northwestern slope of Black Butte at the southeastern corner of Fox Valley. It is well outside of all of the old mining districts, and there is little published reference to it other than old newspaper articles (OR Dept. Geol., 1984). The host rock is Tertiary rhyolite in which gold occurs locally along fractures. Placer gold was initially discovered and worked along Mine Creek, primarily at the Cohoe Mine. It was later traced to its source and the Black Butte Mine (lode) was developed. There are no production records, although it is reported that small lode and placer operations were sustained for several years.

A few lode and placer claims are currently held in the area, and a small seasonal production comes from the placer deposits. The Black Butte Mine workings have been heavily disturbed by surface prospecting, making it difficult to interpret the geology of the deposit. It is of interest in that it is one of very few Tertiary gold occurrences known in northeastern Oregon. Some exploration of the lode mineralization and continued small-scale placer mining can be expected to continue.

**3. Dixie -  
Category IV**

This area is located south and east of Dixie Butte. It joins the Quartzburg area on the west and the Middle Fork area on Davis Creek to the northeast. Most of the area is underlain by metavolcanics of Permian or Triassic age. Tertiary volcanoclastics cover the metavolcanics near Dixie Summit and along the upper portion of Davis Creek. Andesitic flows of Tertiary age extend down Davis Creek toward the Middle Fork of the John Day River (Brown and Thayer, 1966). Scattered patches of gold-bearing gravels are found in the upper portion of the Davis Creek drainage.

Most of the lode prospects are near the boundary of the adjacent Quartzburg area. None show evidence of production. Placer deposits have been worked in the past along Davis Creek, but there is no record of production. A few of the lode prospects are currently under claim, but there is little evidence of recent activity. Placer claims are currently held along Davis Creek and the North Fork of Bridge Creek. The Davis Creek placers have been the subject of recent attempts at commercial scale mining. Most of the near-term mining activity can be expected to take place along the upper portions of Davis Creek.

**4. Flagtail  
Mountain -  
Category IV**

This area is north and east of Flagtail Mountain at the southern end of the old Murderers Creek mining district. Bedrock in the area is predominantly Triassic and Jurassic graywacke, siltstone, mudstone, shale, and tuff with some sandstone, limestone, and andesitic flows and breccia (Brown and Thayer, 1966). A few mercury and gold prospects are found in the area (Brooks, 1963). Mineralization occurs in shear zones and bedding plane fractures.

Past production:

| <u>Mine</u>   | <u>Location</u>            | <u>Production</u> | <u>References</u> |
|---------------|----------------------------|-------------------|-------------------|
| Broadway      | Sec. 7, T. 16 S., R. 29 E  | 21 lbs. Hg        | Brooks, 1963      |
| Roba-Westfall | Sec. 6, T. 16 S., R. 29 E. | 8 fl. Hg          | Ibid.             |

There currently are a few lode claims scattered through the area. The association of mercury and gold mineralization indicates some potential for epithermal gold deposits and may therefore invite exploration efforts.

5. Greenhorn -  
Category III

This area is in the vicinity and to the north of the historic mining town of Greenhorn, in the Greenhorn Mountains. It is largely within the Wallowa-Whitman and Umatilla National Forests, with only its southwestern-most portion extending onto the Malheur National Forest. It includes a portion of the old Greenhorn mining district. All of the bedrock in the Malheur portion of the area is late Paleozoic and Triassic in age. Dominant rock types are serpentinite and serpentinite matrix melange. Metavolcanics, gabbro, and argillite are also found in the area (Brooks et al., 1983; Ferns et al., 1983).

Mineralization is confined to quartz veins and gouge zones in serpentinite which contain talc, carbonate, and sulfides, including chalcopyrite, and sphalerite (Ibid). Many more deposits in a variety of rock types are found within the area outside of the Malheur National Forest.

Estimates of past production from mines within and adjacent to the Malheur National Forest:

| <u>Mine</u>                 | <u>Location</u>             | <u>Production</u> | <u>References</u>      |
|-----------------------------|-----------------------------|-------------------|------------------------|
| Diadem and<br>Brindle Horse | Sec. 17, T. 10 S, R. 35 E.  | \$ 1,800          | Brooks et al.,<br>1983 |
| Psyche                      | Sec. 17, T. 10 S., R. 35 E. | \$90,000          | Ibid.                  |
| Total                       |                             | <u>\$91,800</u>   |                        |

Estimated metal output. 4,400 oz of gold; 800 oz. of silver.

Numerous lode claims now cover the Malheur portion of this area, but only a limited amount of small-scale prospecting activity is currently taking place. The apparently small size of the mineral targets has discouraged larger companies from actively exploring the area. Continued prospecting and small-scale mining can be expected to take place, but largely to the north and east off the Malheur National Forest.

6. Idol City -  
Category III

This area is located approximately 15 miles north-northeast of Burns, and includes the old Harney or Idol City - Trout Creek mining district. Rock is Tertiary andesite which has been mineralized along an altered northerly trending shear zone. Mineralization consists of gold and silver associated with base metal sulfides (Parks and Swartley, 1916).

Past production estimates:

| <u>Mine</u>            | <u>Location</u>                 | <u>Production</u> | <u>References</u>           |
|------------------------|---------------------------------|-------------------|-----------------------------|
| Trout Creek<br>placers | Secs 4 and 5, T 21 S , R. 32 E. | \$50,000          | Parks and Swartley,<br>1916 |

Estimated metal content. 2,400 oz of gold; 600 oz of silver.

There was some development work on the lode deposits in the past, but no production.

Recently, the entire area has been under claim to one company actively exploring for epithermal gold deposits. It is too early to determine the future of the property. If exploration results should eventually prove favorable, development and some mining could take place within 10 years. With marginal or negative results, the area will probably remain the focus of sporadic exploration.

7. Middle Fork -  
Category IV

This is an area of placer gravels along the Middle Fork of the John Day River and some of its tributaries, extending from Vinegar Creek on the east to the Forest boundary on the west. Streams entering the Middle Fork from the north drain the old Susanville, New Eldorado, and part of the Greenhorn mining districts. This area merges with the south slope area below the old settlement of Galena. Ruby Creek, flowing in from the south, drains the northern portion of the Quartzburg mining district. Most of the Middle Fork within the area flows over Tertiary volcanic mudflow deposits. Above Hunt Gulch, Tertiary basaltic to andesitic flows form the bedrock and below Camp Creek, late Paleozoic to Triassic argillite, phyllite, and chert are exposed (Brooks et al., 1983, Ferns et al., 1984). Most of the gold bearing gravels are in alluvium from the present drainage system. Tertiary gravels in the upper portion of the Bear Creek drainage have been worked for placer gold.

Past recorded production:

| <u>Mine</u>          | <u>Location</u>                               | <u>Production</u> | <u>References</u>     |
|----------------------|---|-------------------|-----------------------|
| Middle Fork dredging | Middle Fork Below Elk Creek & On DeWitt Ranch | \$808,000         | OR. Dept. Geol., 1984 |

Estimated metal content: 23,000 oz. of gold; 3,900 oz. of silver.

Much of the Middle Fork has already been mined and/or is in private ownership. Land parcels along unmined stretches of the river which have been recently brought under Federal ownership have been claimed and some test pits have been dug. Given high enough gold prices, it is likely that there will be increased exploration and some mining of unworked gravels along the Middle Fork and its gold-bearing tributaries.

8. Quartzburg - Category III

This area is predominantly within the Dixie Creek drainage, north of Prairie City, west of Dixie Butte, and south of the Middle Fork of the John Day River. It includes the old Quartzburg mining district. A wide variety of rock types are exposed, including: Permian and Triassic metavolcanics, serpentinite, and sedimentary rocks; various Mesozoic intrusives; and Tertiary volcanic and sedimentary rocks. All of the rock types show localized alteration, but all of the known economic mineralization occurs within the pre-Tertiary rocks (Brooks et al., 1984).

Mineralization occurs along northeasterly trends in quartz-tourmaline replacement bodies and in narrow quartz vein-shear zones. Ore minerals include pyrite, chalcopyrite, arsenopyrite, marcasite, cobaltite, glaucodot, erythrite, tetrahedrite, bornite, malachite, sphalerite, galena, bismuthinite, and native bismuth (Brooks and Ramp, 1968; Brooks et al., 1984). The district has produced gold, silver, copper, and cobalt.



Past production estimates for properties on and adjacent to the Forest:

| <u>Mine</u>   | <u>Location</u>                    | <u>Production</u> | <u>References</u>             |
|---------------|------------------------------------|-------------------|-------------------------------|
| Copperopolis  | Sec. 1, T 12 S , R 33 E            | 250 tons          | Brooks and Ramp, 1968         |
| Dixie Meadows | Secs 23 and 24, T 11 S ,<br>R 33 E | \$100,000         | Ibid.                         |
| Equity        | Secs. 2 and 11, T 12 S ,<br>R 33 E | \$500,000         | Ibid                          |
| Keystone      | Secs 2 and 11, T. 12 S ,<br>R 33 E | \$ 37,800         | Brooks et al ,<br>1984        |
| Standard      | Sec 12, T 12 S , R. 33 E           | \$ 82,000         | Ibid , OR Dept<br>Geol. Files |
| Total         |                                    | <u>\$719,800</u>  |                               |

Estimated metal content: 31,800 oz of gold, 16,700 oz. of silver, 272,000 lbs of copper; unknown cobalt

Currently, mining claims are clustered around the Dixie Meadows Mine on the Forest and on Bureau of Land Management land just south of the Forest boundary. Other scattered prospects in the delineated area are also claimed. The Dixie Meadows Mine receives most of the attention and has recently been explored by numerous companies which have taken an interest in the area. Continued exploration can be expected in the area, with the possibility of development and production on one or more of the properties

**9. South Slope -  
Category IV**

This is a large area predominantly along the south slope of the Greenhorn Mountains. It connects with the Middle Fork area along some of the drainages and at the west end near Galena. A portion of it extends into the Desolation Creek drainage north of Boulder Butte and is contiguous on the east with the Greenhorn-Whitney area on the Wallowa-Whitman National Forest. Included are portions of the old Greenhorn, New Eldorado, and Susanville mining districts. A wide variety of rock types are exposed in the area, including late Paleozoic to Triassic argillites, cherts, metavolcanics, gabbro, serpentinite, and serpentinite-matrix melange; Jurassic or Cretaceous quartz diorite and granodiorite intrusives; and Tertiary volcanoclastics and flows and sedimentary units (Brooks et al., 1983; Ferns et al., 1983, Ferns et al., 1984; Brown and Thayer, 1966).

Numerous lode and placer prospects are scattered across the area. All known lode mineralization of economic significance occurs in quartz veins and shear zones in the pre-Tertiary rocks, although some local alteration and disseminated pyrite are found in the Tertiary volcanics. Several drainages have evidence of past placer mining on Quaternary and reworked Tertiary gravels.

Past production estimates:

| <u>Mine</u> | <u>Location</u>             | <u>Production</u> | <u>References</u>   |
|-------------|-----------------------------|-------------------|---------------------|
| Belmont     | Sec 30, T. 10 S., R. 35 E.  | \$ 9,000          | Brooks et al , 1983 |
| Morning     | Sec. 13, T. 10 S., R. 34 E. | \$20,000          | Ibid.               |
| Total       |                             | \$29,000          |                     |

Estimated metal content: 800 oz of gold, 2,700 oz of silver.

Numerous lode and placer claims are currently held in the area--particularly at the eastern and western ends. Activity consists of general reconnaissance, small-scale prospecting of lode deposits, and testing of placer gravels. Generally unsuccessful attempts have recently been made at commercial exploitation of placer gravels in the Big Creek drainage. A molybdenum anomaly in the upper portion of Big Creek has recently received exploration attention from a major mining company, but has been dropped. Continued lode exploration and small-scale placer development/production can be expected in the near future.

10. Strawberry -  
Category III

This is a large area along the north slope of the Strawberry Mountains, extending from just west of John Day and Canyon City to Indian Creek on the east. The old Canyon City mining district is included in the area. Bedrock over most of the area is Triassic gabbro, peridotite, dunite, and serpentinite, with a few patches of Permian metavolcanics (Brown and Thayer, 1966). Canyon Creek (within the area, but outside the Forest) has had very substantial placer gold production. Portions of the area within the Forest are known primarily for their chromite occurrences, although some gold prospects are located on the Forest near Little Canyon Mountain. Chromite occurs as irregular lenses and pods in the peridotite, dunite, and serpentinite (Thayer, 1940). Gold mineralization occurs in pockety quartz-calcite veins in gabbro, pyroxenite, and serpentinite (Brooks and Ramp, 1968).

Past production from mines within or adjacent to the Forest

| <u>Mine</u>        | <u>Location</u>            | <u>Production</u>     | <u>References</u>   |
|--------------------|----------------------------|-----------------------|---------------------|
| Celebration        | Sec. 30, T 14 S , R 33 E   | 684 lt 40% Cr ore     | Thayer et al., 1981 |
| Chambers           | Sec. 13, T 14 S., R 32 E   | 6,000 lt 32% Cr ore   | Thayer, 1940        |
| Dry Camp           | Sec 8, T. 14 S., R 33 E.   | 363 lt 40% Cr ore     | Ibid                |
| Iron King          | Sec. 18, T 14 S , R 32 E   | 6,500 lt 32% Cr ore   | Ibid                |
| Kingsley           | Sec 9, T 14 S , R 32 E     | 200 lt 45% Cr ore     | Ibid                |
| Marks and Thompson | Sec 10, T 14 S., R 33 E    | 400 lt 30% Cr ore     | Ibid                |
| Ray                | Sec 20, T. 14 S., R. 33 E. | 965 lt 38% Cr ore     | Thayer et al., 1981 |
| Total              |                            | 15,112 lt 33% Cr ore* |                     |

\* Chromic oxide ( $Cr_2O_3$ )

There are currently many claims located on or near known chrome occurrences within the Forest. Most of the claims for gold are outside the Forest boundaries. A resource of 208,000 tons of 22 percent chromic oxide was identified in this area by the Bureau of Mines through field work conducted between 1939 and 1942. Less than 1,000 tons has since been mined (Hundhausen et al., 1956; Thayer et al., 1981). The recent interest in chrome as a strategic metal caused an increase in claim staking and exploration. However, the limited size, spotty distribution, and difficulty in exploring concealed deposits reduce the attractiveness of the area as a source for major chrome production.

11. Susanville -  
Category II

This area is centered around the old mining camp of Susanville in the Susanville mining district. Dominant rock types are late Paleozoic and Triassic metamorphic rocks including phyllite, quartzite, and schist, with some slate, greenstone, serpentized peridotite, and gabbro. Numerous aplite dikes of Jurassic or Cretaceous age cut the older rocks. Tertiary volcaniclastics and flows cover the pre-Tertiary rocks in the eastern part of the area (Brown and Thayer, 1966). Mineralization occurs in quartz veins related to northeasterly trending fault zones which roughly parallel the schistosity of the metamorphic rocks. Some mineralization is related to the aplite dikes. Ore minerals include pyrite, marcasite, arsenopyrite, pyrrhotite, sphalerite, galena, stibnite, tetrahedrite-tennantite, and chalcocite (Brooks and Ramp, 1968).

Past production:

| <u>Mine</u>         | <u>Location</u>               | <u>Production</u>  | <u>References</u>        |
|---------------------|-------------------------------|--------------------|--------------------------|
| Badger              | Sec. 7, T. 10 S., R. 33 E.    | \$ 500,000         | Brooks and Ramp,<br>1968 |
| Misc. lode<br>mines | Secs. 5-8, T. 10 S., R. 33 E. | \$ 600,000         | Ibid.                    |
| Susanville          | Elk Creek plus others         | \$ 50,000          | Ibid.                    |
| Total               |                               | <u>\$1,150,000</u> |                          |

Estimated metal content: 40,000 oz. of gold; 646,000 oz. of silver.

The area is presently covered with lode and a few placer claims, including mineral trends extending under the Tertiary volcanic cover. One company has been aggressively exploring the area around the old Badger Mine. Given satisfactory results, development and production could reasonably be expected within a few years. The indications of mineralization are sufficient to maintain an interest in the area even if the present program fails to develop a mine.

12. Unity -  
Category II

This area just touches the extreme eastern point of the Malheur National Forest and is predominantly on the Wallowa-Whitman National Forest. The southern end of the area, in the vicinity of the Malheur, includes hydrothermally altered wacke and siltstone of Jurassic age and diorite and quartz diorite of Cretaceous age. Disseminated copper-molybdenum mineralization has been found within the altered zone (Brooks and Ferns, 1979).

The Malheur portion of the area is away from any historic mining activity, and it is unlikely that any substantial mining activity will take place in this vicinity in the immediate future. All of the mining claims are held by one company which has maintained an interest in the area for several years.

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