ECONOMIC ASSESSMENT OF MINING AND MINERALS-RELATED ACTIVITIES IN THE INTERIOR COLUMBIA RIVER BASIN

by

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DRAFT

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ABSTRACT

This Bureau of Mines document presents an assessment of mineral economics of the Interior Columbia River Basin region. It includes discussions related to mineral production, abandoned mine lands, mine reclamation and remediation costs, trade patterns, and the potential for future mineral activities. Regional geology, mining history, and mineral locations within the Basin are also discussed.

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INTRODUCTION

This study was prepared by the U. S. Bureau of Mines' (USBM) Ecosystem Management Support Team in support of the Bureau's Mission[1] and the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

The ICBEMP was chartered in January, 1994, in response to President Clinton's "Forest Plan for a Sustainable Economy and Sustainable Environment," released in July, 1993. The project, charged with the development of a scientifically sound, ecosystem-based management strategy for National forests in the Interior Columbia River Basin (ICRB), is under the direction of a special agency team led by the U.S. Department of Agriculture Forest Service (FS) and the U.S. Department of the Interior Bureau of Land Management (BLM). In addition to the USBM. other current or anticipated cooperating agencies include, but are not limited to, the U.S. Geological Survey, Bureau of Indian Affairs, Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Service, and Soil Conservation Service. The peace-time cooperation of so many Federal agencies for a single purpose is without precedent.

ICBEMP planners envision the development of four primary products: (1) Scientific Framework for Ecosystem Management in the Interior Columbia River Basin; (2) Scientific Assessment for Ecosystem Management in the Interior Columbia River Basin; (3) Eastside Environmental Impact Statement; and (4) Eastside Ecosystem Management Scientific Evaluation of Planning Alternatives.

Also, an economic assessment of the Interior Columbia River Basin is in development by ICBEMP: -It will address a range of topics that include, among others, timber, water, land use patterns, recreation, and minerals. This Bureau document was prepared in support of the ICBEMP economic assessment

An Overview of the Interior Columbia River Basin

The Interior Columbia River Basin (ICRB) encompasses approximately 220,450 square miles (141,027,300 acres) in major portions of eastern Washington and Oregon, western Montana, all but a small portion of southwestern Idaho, and minor parts of Nevada, Utah, and Wyoming (Fig. 1). Another 72,500-l 10,225 square miles of ICRB lie north of the Canadian border in the province of British Columbia. Elevations in the domestic part of the ICRB range between greater than 14,000 feet along the Continental Divide to near sea level. Geographically, the Basin is characterized in the north and east by high mountains and thick evergreen forests and in the central, western, and southern portions by high orographic desert hosting thick, fertile

[1] The USBM mission is: "To help ensure that the United States has an adequate. dependable supply of minerals and materials to meet its national security and economic needs at acceptable social. environmental. and economic costs."

deposits of glacial loess. The Interior Columbia River Basin as used in this report refers to that portion of the larger Columbia River Basin within the United States and east of the Cascade Mountains.

The ICRB's economy is based primarily on agriculture. Major crops include wheat, barley, fruits (most notably apples), potatoes, vegetables, dry peas, lentils, yams, wine grapes, hops, and grass seed. Timber, mining, -ranching, transportation via the Columbia and Snake Rivers, electric power generation and distribution, and aluminum and other metals processing are also major economic contributors. Recreational pursuits, including tourism, skiing, hiking, fishing, and big game hunting, are rapidly gaining in popularity, especially in Idaho and Montana. The economy of the ICRB is discussed in greater detail in later sections of this report.

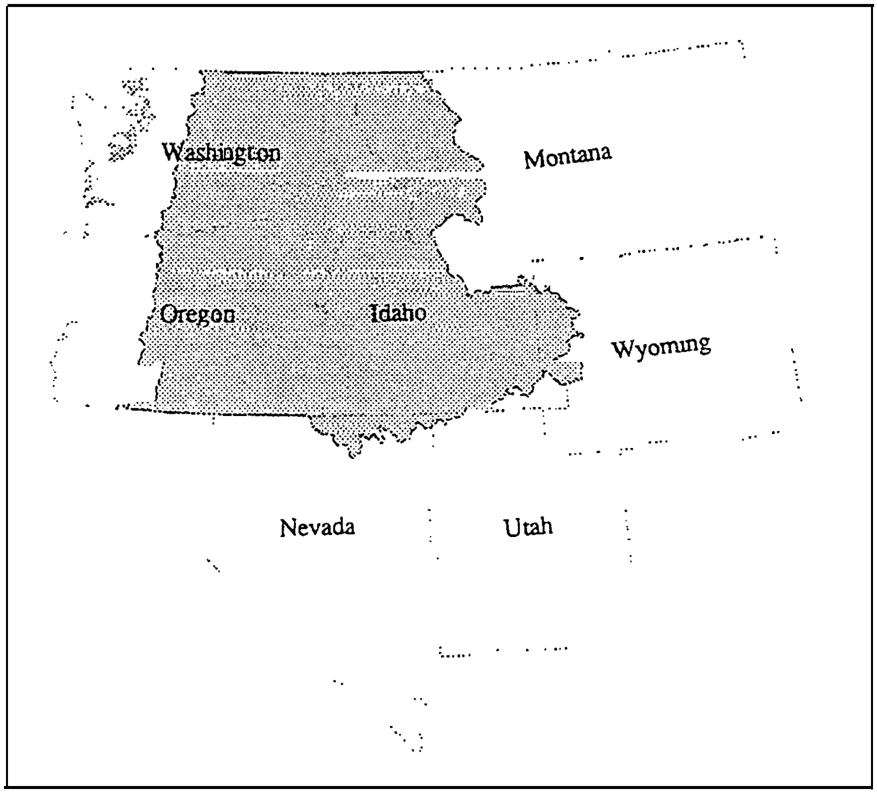

Figure 1. Interior Columbia River Basin Ecosystem Management Project boundary

Major centers of industry, commerce, and education include Portland, Oregon; Spokane, Washington; Coeur d' Alene, Boise, and Idaho Falls, Idaho; and Butte and Missoula, Montana. Portland and Spokane host international airports, are located on major Interstate highways, and are important rail centers for goods moving between Seattle and the Los Angeles area and Seattle and Minneapolis-St Paul.

Geology and Mineral Resources

A detailed discussion of ICRB geology and mineral resources is beyond the scope of this report, however, a comprehensive geological discussion is being prepared by the U.S. Geological Survey (USGS). Based on this it can be stated that the mineral endowment of the ICRB is extensive. Deposits of gold, silver, and base metals such as copper, lead, and zinc have, for more than a century, contributed significantly to the regional economy and, by extension, to the Nation's wealth. The hardrock metal mines of Butte, Montana (referred to as "The Richest Hill on Earth") have produced enormous wealth since the late 19th century as have those of the Coeur d' Alenes, Idaho's "Silver Valley," and the Republic, Wenatchee, and Okanogan districts in

Washington. Gold placers have been worked throughout the basin since before the pioneer days. Other mineral resources such as molybdenum, phosphate, tungsten, nickel, chromite, gemstones, coal, hydrocarbons, and numerous industrial minerals have been discovered and worked in the ICRB. In addition, the potential for new discoveries of mineral deposits in the ICRB is high. The history, production, and economics of ICRB mineral deposits are discussed in following sections.

AN HISTORICAL PERSPECTIVE

An Overview of Early Exploration and Development

In the mid to late 18th century, the northwest coast of the United States was visited by numerous explorers representing the conflicting interests of Spain, England, France, and the United States. Spanish explorers visited the region from 1774 to 1792 and there is some minor physical evidence that Spanish explorers moving from the south, wintered at Okanogan Lake (Washington State) ([1], pp. 35-39).[2]

English explorers visited the region from 1778 to 1792. In June of 1792, a Spanish expedition encountered the British expedition led by George Vancouver near present day Vancouver, B.C. The Spanish and British for a time worked cooperatively, jointly surveying the coast north of the 49th parallel. American trader Robert Gray explored the coast in 1791 and 1792, entered the Columbia River, and founded what is now known as Gray's Harbor, Washington ([2]).

The Columbia River Basin was explored as coastal fur trading interests moved inland. In 1804-06, an expedition was mounted to explore the Oregon Country led by Meriwether Lewis and William Clark. From 1807 to 1811, the North West Company explored to the headwaters of the Columbia River and discovered Athabasca Pass. The company also explored parts of the Colville, Spokane, and Snake Rivers and established British trading posts near present day Kamloops (confluence of the Okanogan and Columbia Rivers) and on the Spokane River.

The Pacific Fur Company established Fort Astoria at the mouth of the Columbia River in 1811 and other forts further inland. In 1811-12, a company-led expedition was mounted to establish a usable trade route between Saint Louis and the Pacific Coast.

From 1834 to 1848, approximately twenty Indian Missions were established in the ICRB. In May of 1842, eighteen wagons and 112 individuals started out from Independence, Missouri on a trek to the Willamette and lower Columbia Rivers, opening the Oregon Trail as a major emigration route; the following year 120 wagons and 1,000 pioneers began the overland passage ([2]).

Potential mineral resources were known in several areas in the Northwest even before the onset of local gold rushes. In present day Cowlitz County, Washington, a coal outcrop on the Toutle River was described in 1833. Gold in the Boise Basin (Idaho) is reported to have been known as early as 1844 ([3], p. 1). According to legend, gold was discovered somewhere in eastern Oregon by an emigrant party in 1845. During the 1850's small groups of prospectors reportedly found placer gold in the Burnt and John Day Rivers area ([4], p. 43). While exploring

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[2] Underlined superscript numbers in parentheses refer to citations in the reference section.

for a railroad route through the Cascades in 1853, Captain McClellan and his party found traces of gold in Washington's Yakima Valley. In 1855, there was a small gold rush to the Colville region (5, p. 28), but this rush may have actually been in British Columbia (6, p. 4).

In 1860, gold was found in Nez Perce country (Idaho) in the region drained by the Clear-water River (3, p. 1; 7, p. 138). According to Paul (7), after the discovery some prospectors stayed in the wilderness, wintering along Orofino Creek. A large number assembled during the winter in Walla Walla, Washington while others founded Lewiston, Idaho, an advanced depot on the Snake River. The rich placers in the Boise Basin spurred a rapid advance of prospectors up the drainages of central Idaho's rugged mountains and across the Snake River Plain to southwestern Idaho in 1862. This led to the discovery of numerous mining districts, the more important of which include: Owyhee (1863), Rocky Bar-Pine (1863), Atlanta (1863-64), and Yankee Fork (1870).

During the next several decades in Idaho, base metal and silver mining districts would become the centers of mining rushes and development. The more important include Bay Horse-Clayton (1872), Wood River (1873), Coeur d'Alene (1884), Blackbird-Cobalt (1892), and Stibnite (19 14). The Coeur d' Alene mining district has far out-produced any other metal mining district in the state, and was originally a gold placer discovery in 1882. The Northern Pacific Railroad, then building across the region, promoted the Coeur d' Alene district's gold potential in 1884, but it soon (1884-85) became apparent that lead-silver ores were the real wealth of the region (7, pp. 148-149).

In eastern Oregon, gold was discovered in 186 1 in a tributary of the Powder River; the following spring gold was found near John Day in Canyon Creek By the end of 1862 the mining camp of Auburn, near the Powder River discoveries, had a population estimated between 5,000 and 6,000; a similar camp opened at Canyon City. From Auburn and Canyon City, prospectors spread out through the Blue Mountains, and by the end of 1864, almost every placer mining district in eastern Oregon was producing. Gold-bearing veins were discovered soon after placer mining commenced. At the Virtue mine, about 8 miles northeast of Baker, underground development began in 1862, and a lo-stamp mill was built on the outskirts of Baker in 1864 (4, p. 43-49).

Base metal production in Oregon has been relatively small. Most copper produced east of the Cascade Mountains came from the Iron Dyke mine which was discovered in 1897 (4, p. 93). Little lead and zinc came from the east side of the state.

In Washington Territory, the first profitable gold discovery was made in 1859 by a soldier who encountered gold-bearing gravels on the Similkameen River. The resulting rush caused Okanogan City population to reach nearly 3,000. Over the next 10 years, prospectors found placer gold in numerous streams on both sides of the Cascades including Peshastin (1860) and Swauk (1868) Creeks, the principal placer gold producing district in Washington. Lode gold was discovered near the base of Mount Chopaka, Okanogan County, in 1871, and development work was soon well underway. After the 187 1 discoveries, interest in prospecting for lode gold spread throughout the Territory resulting in discoveries at Culver Gulch and Swauk Creek in 1874, gold-base metal lodes in the north Cascades in the 1890's, and near Republic in 1896 (6, p. 4-11).

Significant base metal and silver lodes were discovered during the late 1800's and early 1900's. The most important include: the Old Dominion Mine (lead-zinc, 1883), the Bonanza

Mine (lead-silver, 1885), and the Deer Trail and Chewelah Silver Districts (1894) in Stevens County; the Ruby-Conconully District (silver-base metal, 1886) in Okanogan County; and the Metaline District (lead-zinc, 1902) in Pend Oreille County (6, p. 4-1 1).

In Montana, important placer discoveries were made at Bannack in the summer of 1862, at Alder Gulch (Virginia City) in 1863, Last Chance Gulch (Helena) in 1864, at Butte in 1864, and Confederate and Emigrant Gulches in 1866. Of these important early discoveries, only the Butte district is in the Columbia River drainage.

The Butte district had been a prosperous placer camp until the late 1860's, but by 1870, Butte was becoming a'ghost town (241 people according to the 1870 census). In the mid 1870's silver lodes began to be put into production and in 1879 a smelter was opened to treat local silver ores and concentrates. Marcus Daly, in 1881, purchased the copper-rich Anaconda claim, and with the help of financial backers, formed the Anaconda Copper Company. This firm rapidly accumulated mining properties on Butte Hill and constructed major concentrating and smelting facilities. Beginning in 1887, the Butte district surpassed the copper production of Michigan's Keweenaw Peninsula and in 1912 Weed describes Butte as "... the most important mining center in the United States..." (7, pp. 146-148).

Base metal-silver discoveries in the ICRB were commonly preceded by minor to moderate gold production and short-lived gold rushes. Placer gold deposits were the easiest deposits to exploit, requiring relatively simple technology and equipment that could be built on site. Also the shallow underground free gold lodes were relatively easy to exploit. Base metal-silver (also gold-bearing sulfide) deposits required the processing and smelting of complex sulfide ores. The milling machinery and smelting facilities needed could not be easily built on site without the support of railroads, improved roads or trails, and large capital investment. These factors commonly led early discoverers of the base metal-silver lodes to exploit only the highest grade ores, or ore that could be shipped to distant smelters at a profit. With the development of improved transportation to a region and (to a significant degree) improvement in metallurgical technology, a base metal-silver district would become more completely developed and production would increase dramatically.

The "real" production values for the states comprising the bulk of the ICRB (Idaho, Oregon, Montana, and Washington), along with the United States as a whole, for most of the 20th century are shown in Figure 2 . Over this period of time, Idaho, Oregon, and Washington had relatively constant "real" production values, while Montana has had much greater variability in value over the same period; the corresponding value for the U.S. has been generally increasing. Fuel production is included in the graphic until 1977.

Much of the growth in mineral value in Montana and the U.S. was from fuels. The value of fuel production grew from 18 percent of Montana's total in 1925 to nearly 70 percent in 1975, while in the U.S. it grew from 30 to 70 percent over the same timespan. Fluctuations in value from the late 1970's to the present in Idaho and Montana can be attributed to the large increase and subsequent variability in the value of metallics, notably gold and silver, on world markets. This encouraged expansion of production in these states. The fluctuation in price during the 1980's caused wide variability in mineral production value in two ways. Production shifted in

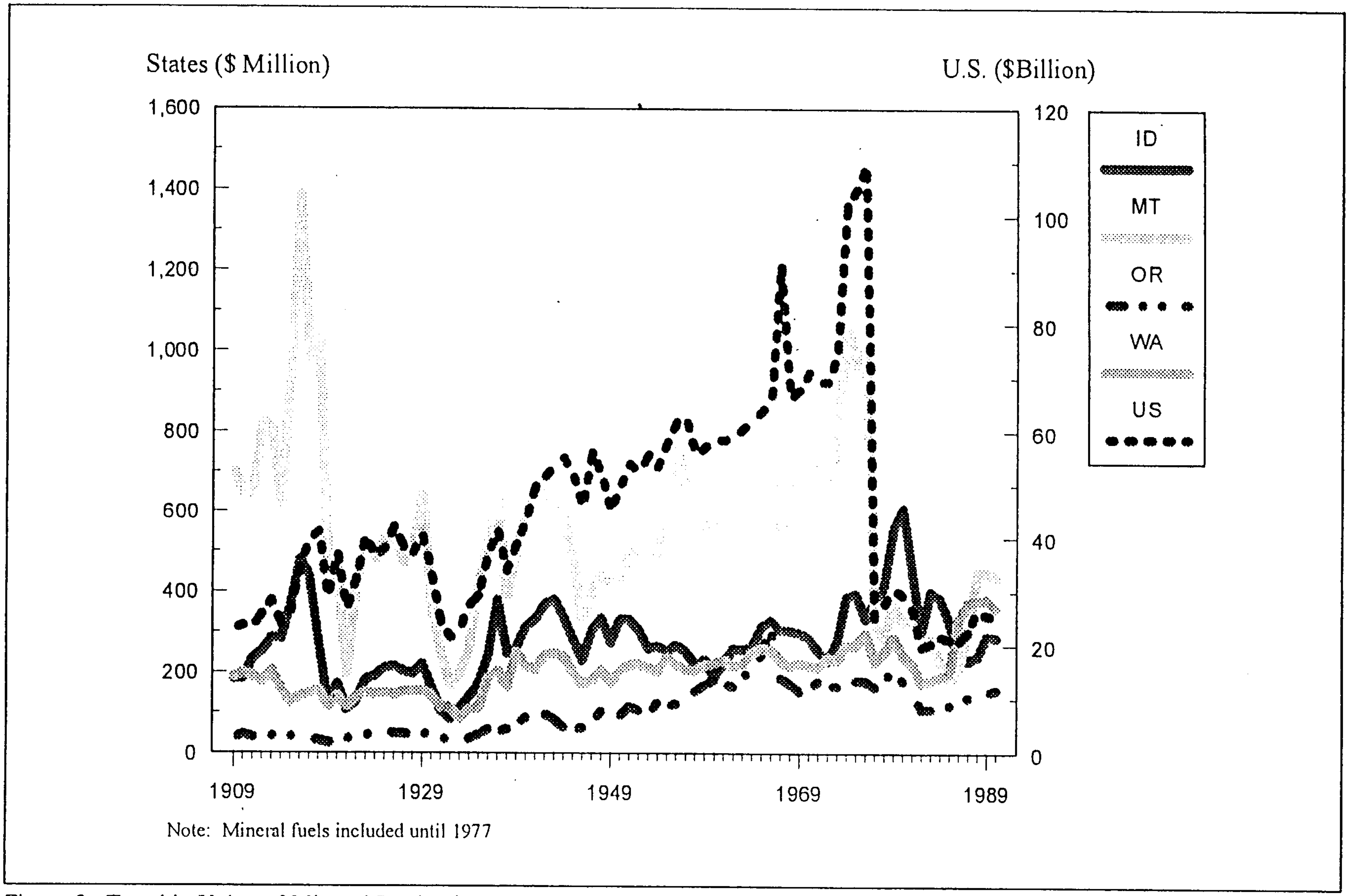

Figure 2. Trend in Value of Mineral Production, 1909-1990, in constant 1982 dollars. See also Table A1.

response to price changes and fluctuating prices were applied to the production that did occur. The value in Montana showed a spike in the eatly 1970's as a result of the increase in the price of oil, however, little of the oil production in Montana was (or is) produced in the ICRB portion of the state. In 1976, for example, while more than 44 percent of the mineral value of the state was from the production of petroleum, none came out of ICRB counties.

Over the period of the graph, the value of mineral production in Washington increased steadily, with the growth becoming more rapid in the late 1970's and 1980's. While part of this increase was because of expanded gold production, most was a result of a strong demand for construction materials, especially cement, construction sand and gravel, and crushed stone,

Nearly all of the modest nonfuel mineral production value in Oregon has been from industrial minerals, stone, sand, gravel, cement, and lime.

In recent years, the mining sector has accounted for as much as 13 percent (see Beemiller, reference 9) of one state's total value added (Montana, 1982) and represented more than 4 percent [3] for the ICRB as a whole in 1990. More information on the role of mining in the economy of the ICRB is provided in a following section.

Inactive and Abandoned and Mine Lands

One consequence of mining in the ICRB has been the creation of various types of environmental hazards at some mining or processing sites. An assessment of the potential for such hazards at known sites was conducted, and the results are presented below. They are intended to provide a prioritized listing of sites where further study should be directed to determine the degree and nature of possible hazards.

The starting point for the assessment was the Bureau's Mineral Industry Location System (MILS). Specific parameters that relate to the potential for environmental hazards were determined for each site. These include the site's size, current status, type of operation, type of processing plant and the commodities produced at the site (critical in an appraisal of possible environmental effects). Each of these components was assigned a numerical factor related directly to its expected influence in contributing to environmental hazards. The steps for estimating hazard potential and the factors used here are outlined in the draft document "Abandoned Mine Land Inventory and Hazard Evaluation Handbook" which is discussed in the following section. An overall score was calculated for each site, and then used to rank the sites by their potential for deleterious environmental effects.

Of 20,945 locations identified in the ICRB, 6,644 were stone, sand, gravel or other industrial mineral sites, and were considered to have little potential for environmental hazards. These, plus 35 1 sites considered active by virtue of current production, development, exploration, or reclamation activities, were excluded from further analysis. The potential for environmental hazards was assessed for the remaining 13,950 inactive or abandoned sites. The results are summarized in Table 1 for the ICRB and two sub-areas that will be used in the development of Environmental Impact Statements (the Easrside Study Area and the Upper Columbia River Basin).

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[3] Micro IMPLAN Software. Minnesota IMPLAN Group. St. Paul. MN.

Environmental hazard category	Eastside Study Area sites	Upper Columbia River Basin sites	Total sites in both areas
A – high	76	88	164
B – possible	79	111	190
C – undetermined	1,154	2,806	3,960
D – no hazard	3,206	6,430	9,636

Table 1. Summary of potential for environmental hazards at identified mine sites.

At most mine sites in the study area, no environmental hazards are likely (Category D). These sites are mostly prospects or small-scale past producers with limited surface disturbance and little expected concentration of possibly hazardous materials.

At a smaller number of sites, information is not sufficient to assess potential for environmental hazards (Category C). These sites include those where status, associated commodities, or other relevant data are unavailable. Sites in this category are poorly documented in the literature: for some, even the, location is not precisely known. Given the long history of exploration and the increased concern with environmental issues, a preliminary assumption, subject to revision, is that such sites are relatively small and environmentally benign.

The potential for environmental hazards is considered high at 164 sites (Category A), and hazards are possible at 190 sites (Category B) in the ICRB. These are mainly past producers of gold, silver, copper, lead, or zinc. 'Others were mined for antimony, barium, chromium, cobalt, fluorite, manganese, mercury, molybdenum, phosphate, tungsten, or uranium as primary products. The sites are concentrated in historic mining districts (Table 2). Size of production ranges from very small to large, and most had milling facilities on site. Active sites are not included in this category although several are currently (1994) undergoing environmental characterization or preliminary reclamation. The locations of the mine sites in Category A or B are shown in Figure 3. Those sites falling into Category C are shown in Figure 4. The potential costs associated with the clean up of IAML sites are discussed in a later section.

Abandoned Mine Land Inventory and Hazard Evaluation Handbook

Government agencies, because of recently enacted regulations, face a rapidly expanding, costly liability for the cleanup of hazardous waste sites. This is particularly true for public lands containing abandoned mining and milling sites. The Environmental Protection Agency (EPA), in its 1985 report to Congress, estimated the total volume of existing mine wastes to be more than 50 billion tons. A 1991 report prepared for the Western Governors' Association indicates the total number of sites to be hundreds of thousands and the potential cost of remediation to be billions of dollars.

State	Locations with high potential for environmental hazards		Locations with possible environmental hazards	
	Sites	Mining districts	Sites	Mining districts
Idaho	66	38	74	36
Montana	17	14	14	10
Nevada	4	3	23	11
Oregon	38	16	45	23
Utah	1	1	None	
Washington	38	19	34	14
Wyoming	None		None	

Table 2. Mining locations in the Interior Columbia River Basin with "high" and "possible" potential for environmental hazards.

Bureau of Mines records show that at least 200,000 mining-related sites, most abandoned or inactive, exist nationally. The obviously hazardous sites, especially those in proximity to urban areas, have been targeted under Superfund. Of the more than 1200 sites on the National Priorities List (NPL), 47 are directly related to mining. However, of the remaining mine sites, those that deserve priority attention and, just as importantly, those which can be ignored, are largely unidentified. Most of these sites will be in rural areas, most often on or surrounded by public lands, and thus the responsibility (CERCLA, Section 120) of Federal land-management agencies. In the absence of a clear understanding of the scope and severity of the hazards associated with inactive and abandoned mine lands (IAML), the public and government agencies are very concerned about the true risks posed by these lands. This concern, and regulatory mandates, has prompted a need for detailed inventories of IAML and analysis of IAML hazards.

The purpose of the Bureau Handbook, then, is to facilitate standardized; consistent inventories. It is probable that there will be a desire to complete an inventory of all sites in a short timeframe. It is also probable that many investigators will not have an extensive mineral and environmental science background. The handbook provides such an investigator with sufficient knowledge and guidance to be able to conduct an effective, efficient IAML inventory and evaluate the environmental and physical hazards present. It is not intended to be an in-depth source of information; however, an extensive bibliography is included. Also, because coal mines have already been inventoried according to Office of Surface Mining directives and procedures, the handbook is focused on hardrock (including industrial and nonmetallic minerals) IAML sites.

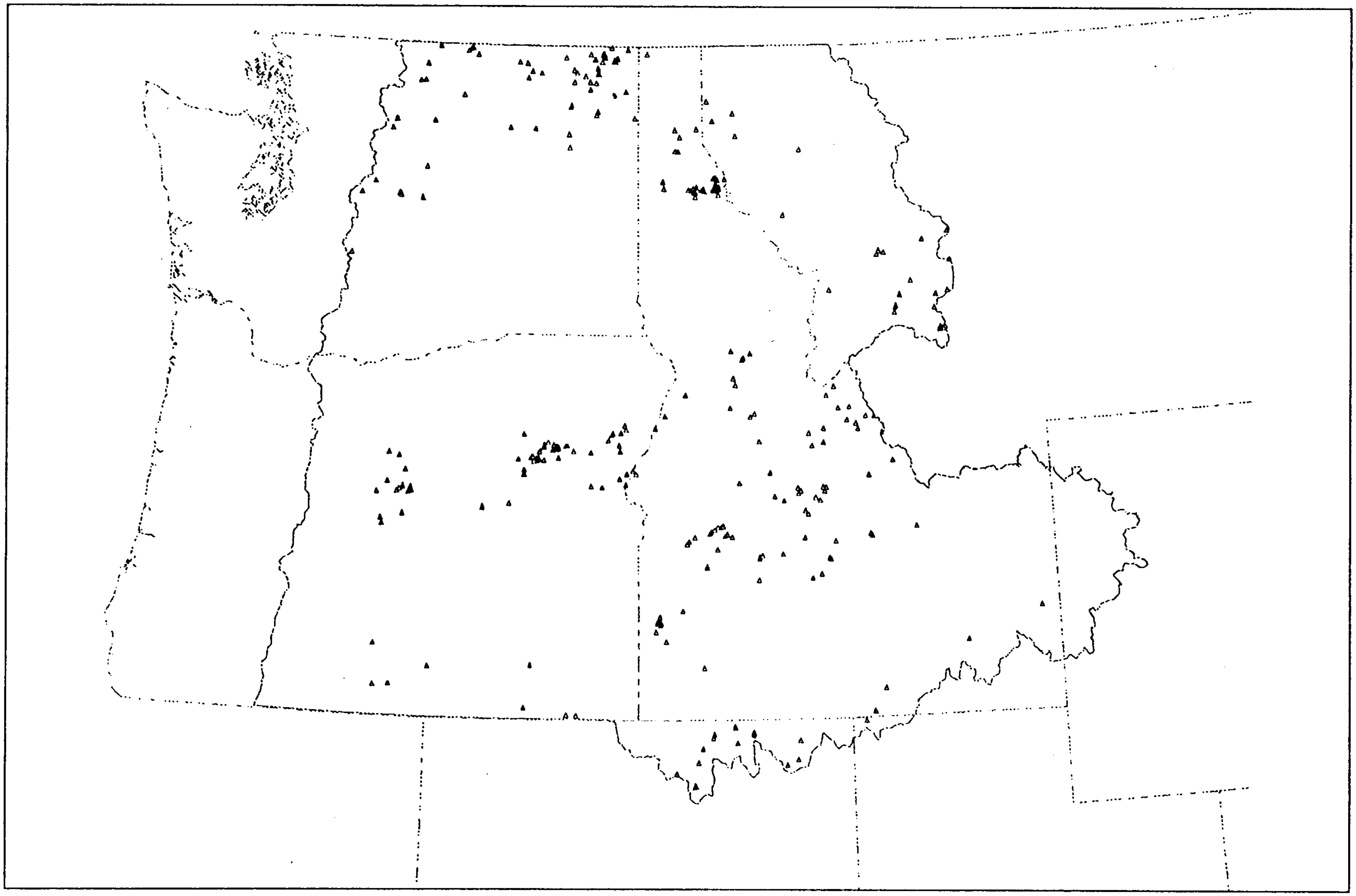

Figure 3. Locations of potential environmental hazards from IAML sites

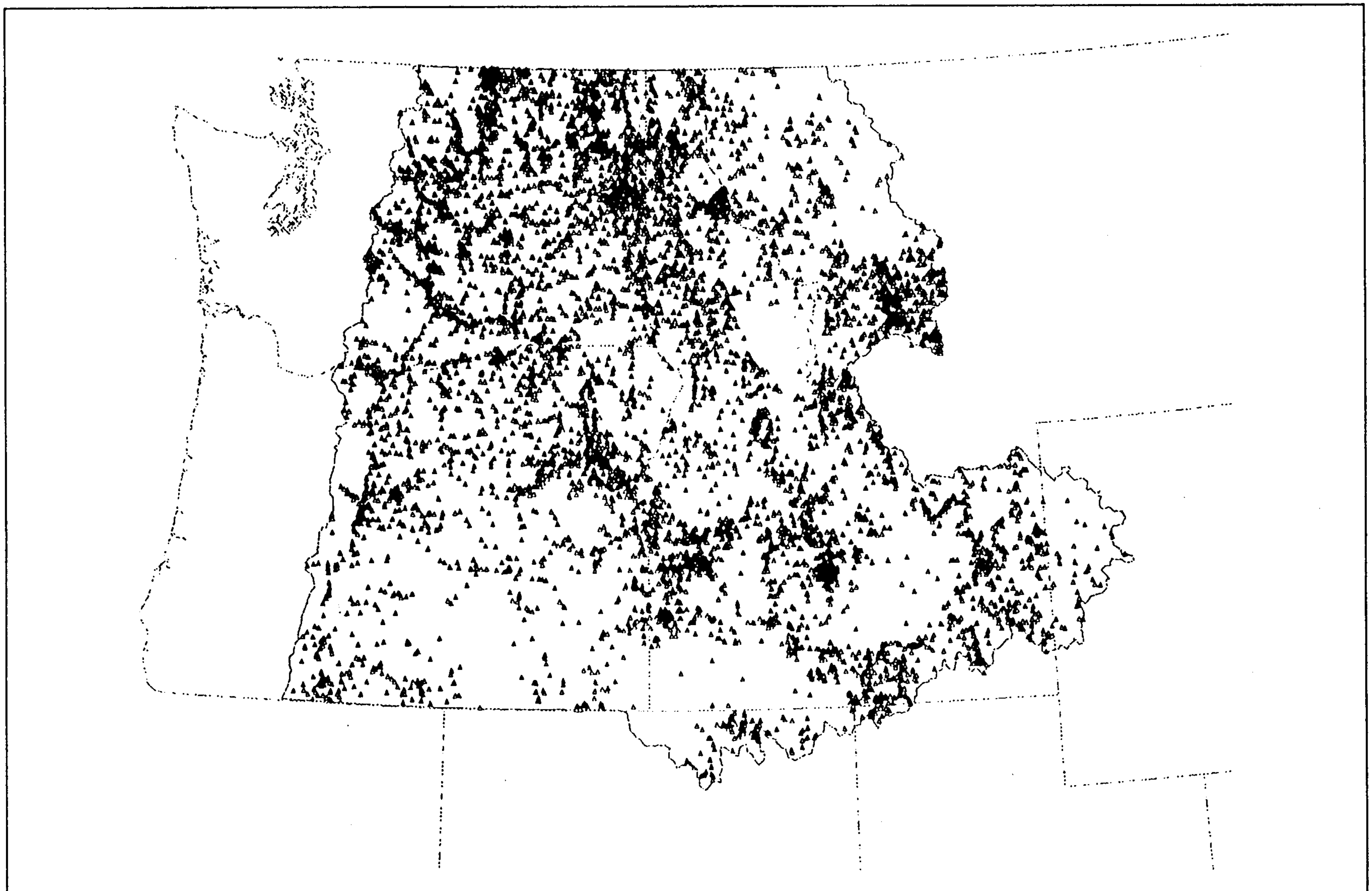

Figure 4. Locations of IAML sites with undetermined environmental hazard potential.

The IAML inventory and evaluation process presented in the handbook is designed to efficiently and accurately identify priority sites. It entails four steps: Step I-development of an IAML database/list of sites using files, literature, databases, and other sources; Step II-selection of sites for half-day field investigations; Step III–field investigation of selected sites using a standardized reporting form; Step IV-identification of sites requiring future action.

Many Federal and State agencies have developed, or are in the process of developing, data reporting forms. The data reporting forms presented in the handbook include those mine or mineral-related features the Bureau feels to be of the most importance in an IAML inventory. The Bureau is interested in working with other agencies and organizations in an effort to standardize data reporting forms.

While consistency among inventories is highly desirable, investigators can modify, augment, or supplement these steps and/or the data reporting forms to suit their own requirements, or incorporate portions in an established system.

Aesthetic Considerations of Mining in the Columbia River Basin

Prior to the 1970's, little consideration was given to the visual impact of mining. operations, many of which were located in scenic mountainous areas. Mine operators, under prevailing laws and regulations, were within their rights to simply abandon an operation on depletion of ore reserves. The legacy is a multitude of scarred landscapes and abandoned mines. However, it must be noted that, in most part, abandoned mines exist in remote areas.

Current regulations not only require that operators ensure the mine site is environmentally and physically safe on closure, but also require restoration efforts that include aesthetics. Today's mining companies take strong measures to ensure that their operations minimize environmental disturbance, protect employee health and safety, and maintain good relations with nearby communities.

Measures recently taken by mining companies to reduce visual impact of their operations include, but are not limited to:

- Screening waste dumps, stockpiles, and tailings ponds with trees, shrubbery, and tall grasses.
- Painting mine and mill buildings to blend with the background.
- Locating buildings, dumps, stockpiles, and tailings ponds behind hills, trees, etc. to minimize visual impact.
- Blending waste piles to match background colors.
- Re-routing roads and highways to take advantage of natural cover.
- Construction and planting of berms to mask mining operations.
- Contouring pit highwalls, waste piles, and tailings disposal areas.

As more people take advantage of the recreational opportunities provided on public lands, mine operators will be under increasing pressure to minimize and eventually mitigate the visual impacts of their operations.

RECENT MINERAL ECONOMIC ACTIVITY

Production Trends and Geography

Mineral production plays an important role in the economy of the ICRB. Mining is a source of employment and income for the region and generates these benefits both directly and indirectly. Direct benefits include the revenues from production at the mines and the personal earnings and employment of the labor forces. Taxes paid by mines are also a direct benefit of the operations, and taxes include income, property, and sales taxes, as well as permit fees. Indirect regional benefits arise from local industries spending what they receive from the mines and mine employees. The importance of mining is not limited to its contribution to employment, earnings, and output. Its significance extends to the role of mining output as inputs to other sectors of the economy, including agriculture, construction, and manufacturing.

The part that mining has played in the regional economy can be shown in a variety of ways. These include the value of the minerals produced in the region and how that production. compares to the production of the rest of the nation, the contribution of mining to the gross state product (GSP) of the states in the region, and employment and earnings generated by mining. Due to data availability, the most recent value of production numbers are limited to nonfuel minerals while GSP contribution, employment and earnings numbers refer to the entire mining sector including fuel minerals. These measures give varying perspectives on the relative importance of mining. For example, since mining is a high wage sector, it shows greater significance as a contributor to personal earnings than to employment. These measures may be examined-at various levels to gain a broad view from a state- and region-wide perspective as well as a more focused local one.

The ICRB is contained primarily in four states: Idaho, Montana, Oregon and Washington. Examining the position of the mining sector in these states provides an overview of the importance of mining in the region. For 1990, the value of the production of nonfuel minerals in Idaho was $375318,000; in Montana, $573,294,000; in Oregon, $204,595,000; and in Washington, $473,059,000. Combined, this accounted for 5% of the total nonfuel mineral production value in the United States. The historical trend of production in these states as well as the United States as a whole is shown in Figure 2, and refered to in the historical section.

One measure of the significance of an activity to the overall economy of a state is its contribution to the total, or gross, product of the state. Gross state product is a measure of the money value of the goods and services becoming available in the State as a result of economic activity(f). A given sector's contribution is its value added, i.e., the value of its output less the value of its inputs. 'The contribution of mining to the GSP of the states in the region'is varied. In 1990, the contribution of mining in Idaho was 1% of the state total, Montana, 6.5%, Oregon, about 0.1%, and for the state of Washington, 0.3%. According to the data for the Micro IMPLAN software package,[4] the mining contribution to the overall product of the ICRB for 1990 was 4.2 % of the total. The majority of this was from nonfuel minerals, with the mineral fuels accounting for less than one quarter. of the mining contribution.

[4] Micro IMPLAN - Impact analysis for planning software. Minnesota IMPLAN Group. St. Paul, MN.

GSP, as well as the contribution of mining to GSP for selected years from 1977 to 1990, are shown in Figure 5 and Table 3 (9). These illustrations show that while mining in the four states has made consistently increasing contributions to GSP in absolute terms, these increases have not kept pace with increases in other sectors and, therefore, has resulted in a declining position for the mining sector in these states. In Idaho, 15% of the GSP increase was in the manufacturing sector and 36% in the Finance, Insurance and Real Estate (FIRE) and Services sectors; less than 1% of the increase came from the mining sector.

In Montana, mining grew more and accounted for 6% of the change, but this is compared to 52% contributed by the Transportation and Public Utilities, FIRE, and Services sectors. In Oregon the largest change was in the Manufacturing, FIRE and Services sectors, at 54% of the total change. Similarly, in Washington the greatest growth came in those three sectors accounting for 53% of the change. The mining sector's contribution to employment in these states ranged from about 0.1% to 1.5% of the individual state totals. Mining earnings range from 0.2% to 3% of the totals for these states. State GSP and mining employment and earnings from 1969 are shown in Table 3 and Figures 6 and 7[5].

State	GSP part	Year						
		1977	1982	1986	1987	1988	1989	1990
Idaho	Total	7.363	10.875	13.714	14.600	15.630	17.542	18.555
	Mining	.097	.174	.154	.142	.180	.193	.201
Montana	Total	6.477	10.608	11.487	11.842	11.969	13.200	13.331
	Mining	.458	1.403	.794	.759	.848	.845	.862
Oregon	Total	21.971	30.810	41.681	44.870	48.479	52.364	55.426
	Mining	.063	.065	.061	.061	.060	.064	.081
Washington	Total	35.003	58.696	78.688	84.766	91.241	99.882	109.362
	Mining	.054	.146	.183	.201	.244	.303	.306

Table 3. Total GSP and mining contribution ($B). See also Table A2.

The relatively small and declining contribution of mining to GSP, and relatively small overall employment and earnings contributions, does not imply that mining is an unimportant sector in the region. Much of the impact of mining is localized, with some counties economically dominated by the mining sector.

The ICRB is contained within 100 counties of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming. These counties had a combined nonfuel mineral production value of approximately $13 billion over the period 1980 through 1992. This represents more than

[5] Source: Regional Economic Information System (REIS), 1994, Bureau of Economic Analysis

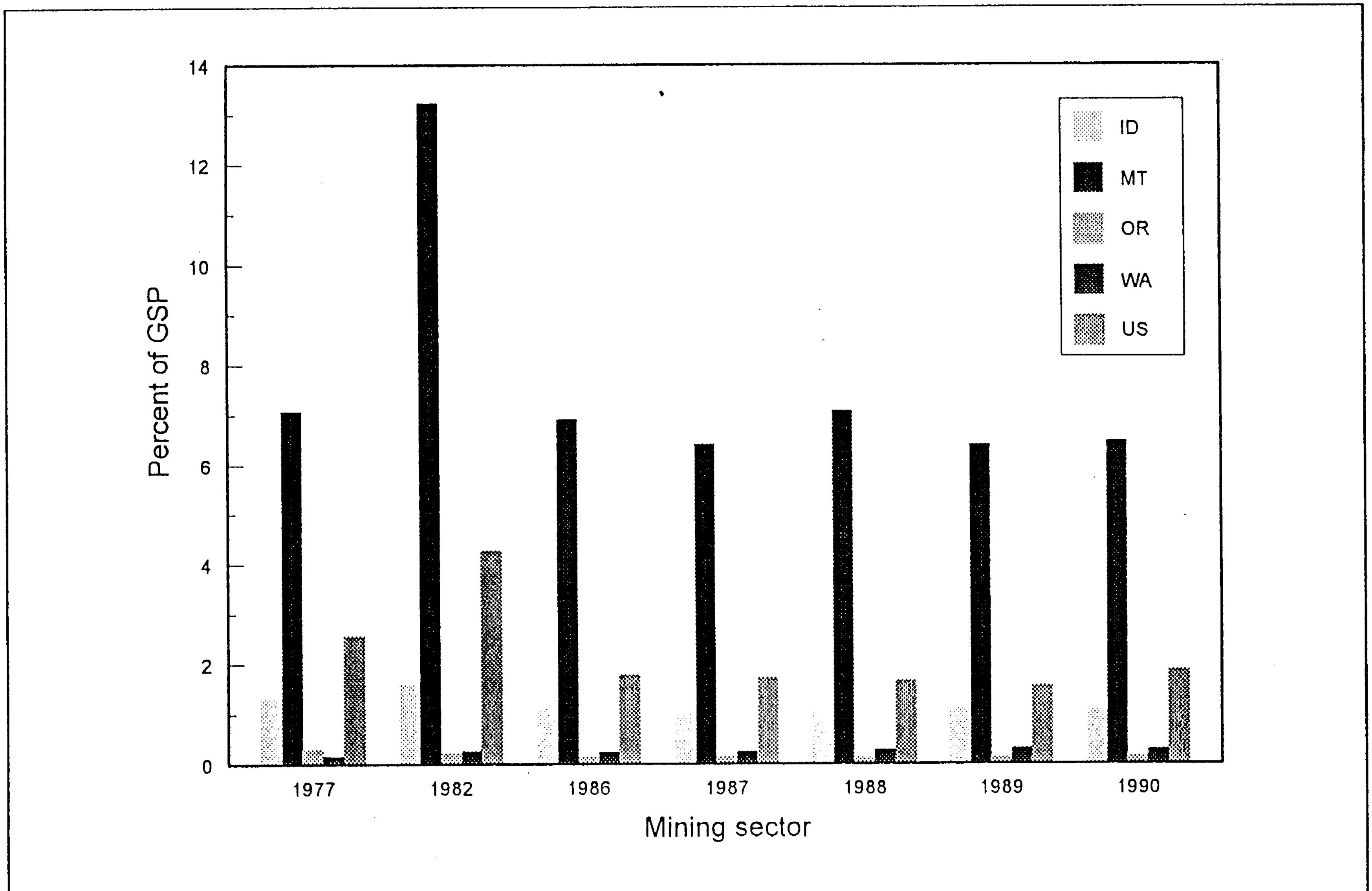

Figure 5. Mining sector share of gross state product, selected years 1977-1990.

3.5% of the United States total over that same period. As can be seen in Figure 8, the production of metals represented the dominant portion of the nonfuel mineral production in the ICRB, approximately 75 % of the total value generated over this period. This occurred despite the deep and prolonged depression of metals prices in the late 1980's and the resulting production cutbacks and mine shutdowns. By far the largest part of this came from the production of gold. The metals silver, copper, molybdenum, magnesium, lead and zinc, and the industrial minerals phosphate and sand and gravel also feature prominently in the region.

The ICRB has been divided into subregions following ecological boundaries. These subregions are shown in Figure 9 and are as follows: Eastern Cascades, Northern Rockies and Okanogan Highlands, Blue Mountains and Idaho Batholith, Yellowstone Highlands, and Inter-mountain Semi-Desert. As is the case in the ICRB as a whole, metals dominate the production value of the subregions. As is shown in Figure 10, only the Yellowstone Highlands region has an industrial mineral, phosphate, leading in value over the period shown.

Table 4 shows the value of nonfuel mineral production in subregions for 1992; Figure 11 [6] displays the same information for the period 1984 through 1992. The table shows the break out between the production of sand and gravel and stone, and other nonfuel minerals. Sand, gravel, and stone represent a significant portion of the total value produced in each of the regions. This is due to the fact that these materials form the basis for infrastructure and other construction activities and, therefore, are used and produced virtually everywhere. A further discussion of the. market for the various minerals produced in the ICRB can be found in the fourth section of this report.

Region	Totals for sand, gravel, and stone[1]	Totals for others[2]	Total
Eastern Cascades	w	w	65.466
Northern Rockies and Okanogan Highlands	w	w	151,188
Blue Mountains and Idaho Batholith	w	w	194.237
Yellowstone Highlands	59.523	12.813	72,336
Intermountain Semi-Desert	545.383	45.163	590.546

[1] St one estimated based on 199 1 data.
W–withheld to avoid disclosing confidential data.
[2] Includes all minerals except sand and gravel, stone, and fuels.

Table 4. Value of nonfuel mineral production ($000) for 1992, in constant 1987 dollars. See also Table A5.

[6] Source: USBM files

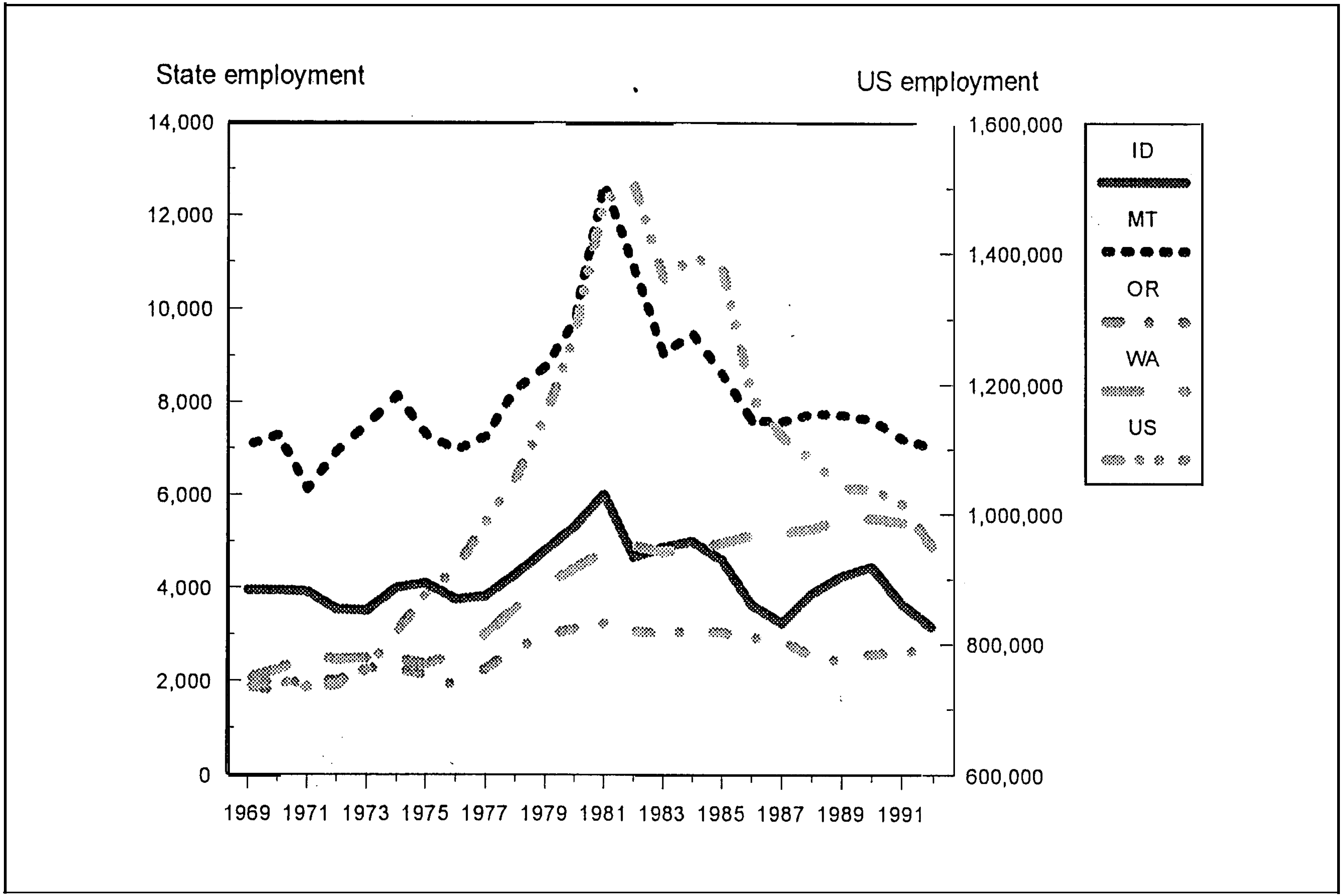

Figure 6. Mining sector employment--ID, MT, OR, WA and U.S. See also Table A3.

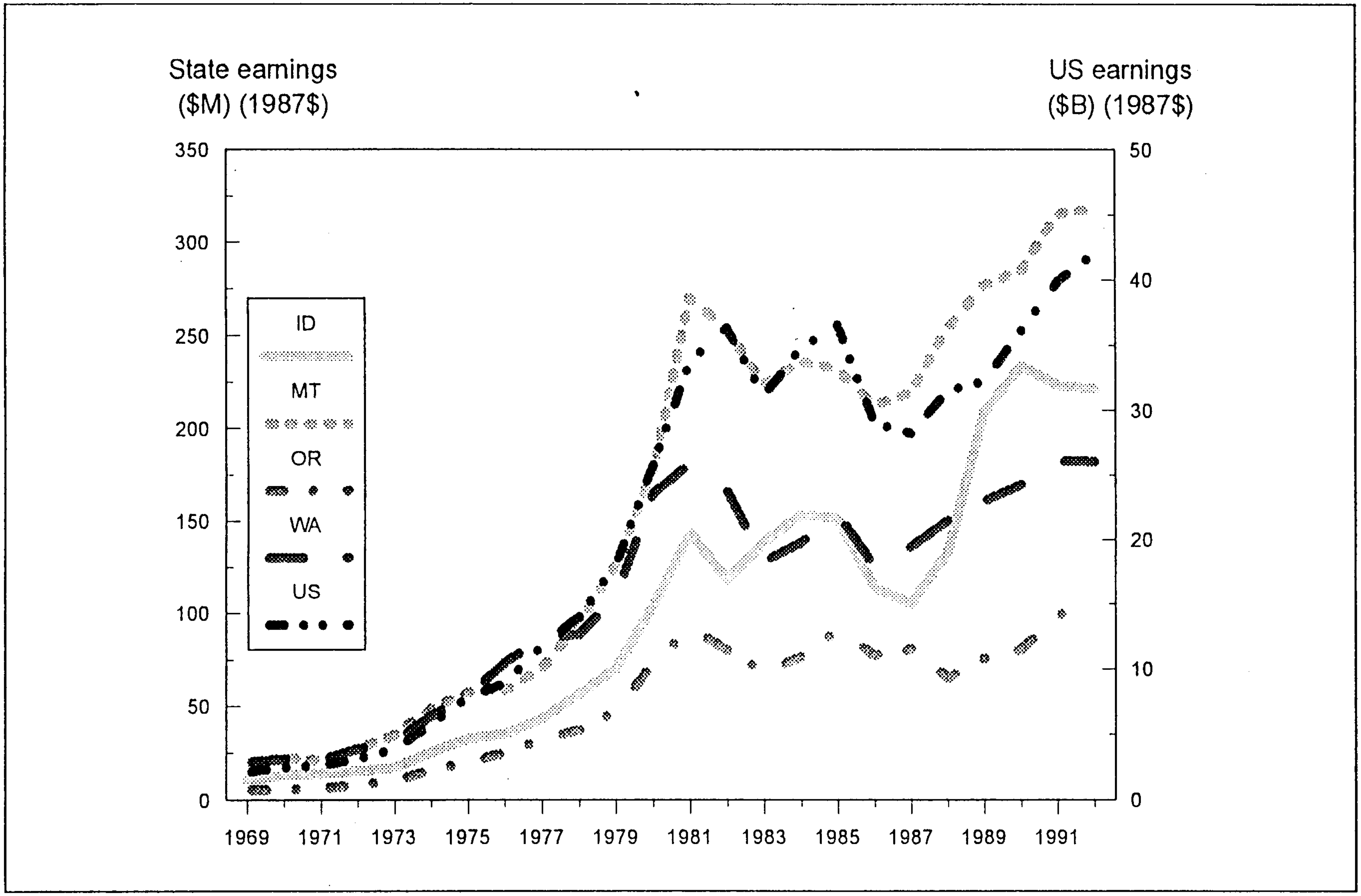

Figure 7. Mining sector earnings--ID, MT, OR, WA and U.S. See also Table A4.

Gold
Silver
Copper
Phosphate
Sand and gravel
Stone
Molybdenum
Magnesium
Lead
Diatomite
Vermiculite
Zinc
iron ore
Barite
time
Mercury
Vanadium
Pumice
Clays
Antimony
Abrasives
Perlite
Feldspar
Salt
Tungsten
Gypsum
Peat
Beryllium
Zeolite

Metals	75%
Nonmetal commodities	15%
Sand & gravel, stone	10%

$ 13 Billion

Figure 8. Nonfuel mineral production in the ICRB, in order of value, in constant 1987 dollars, cumulative 1980-92.

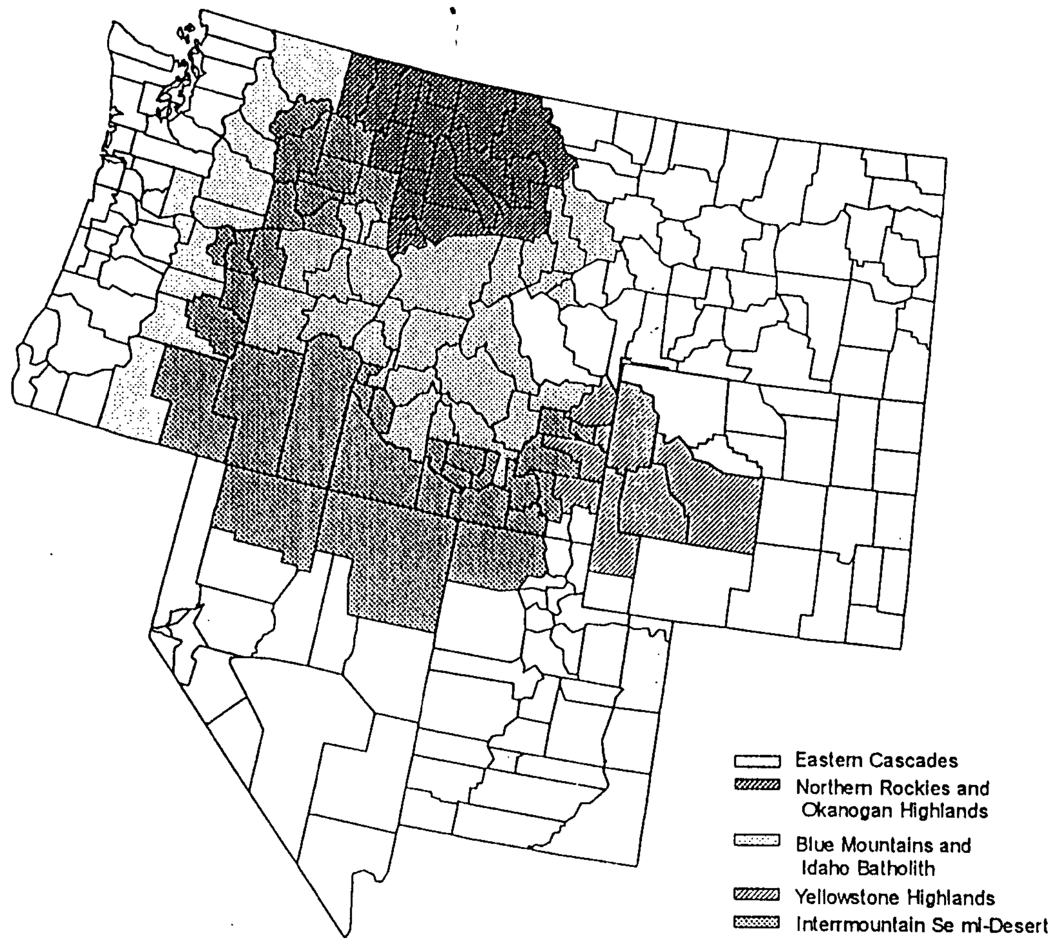

Figure 9. Groupings of Interior Columbia River Basin counties.

Eastern Cascades	Northern Rockies and Okanogan Highlands	Blue Mountains and Idaho Bathollth	Yellowstone Highlands	Interrnountain Semi-Desert
Gold	Silver	Copper	Phosphate	Gold
Stone	Copper	Molybdenum	Iron Ore	Sand & gravel
Sand & gravel	Magnesium	Gold	Vanadium	Phosphate
Pumice	Gold	Silver	Sand & gravel	Silver
Silver	Lead’	Sand & gravel	stone	Diatomite
Gypsum	Sand & gravel	Stone	Pumice	Stone
Clays	Vermiculite	Phosphate	Lime	Bartte
Peat	Zinc	Clays	Beryllium	Mercury
Copper	Stone	Zinc		Lime
Lead	Lime	Lead		Clays
	Bartte	Feldspar		Vanadium
	Antimony	Gypsum		Copper
	Abrasives	Tungsten		Pumice
	Perlite	Pumice		Salt
	Clays			Tungsten
	Peat			Lead
	Tungsten			Zinc
	Zeolite			Zeolite

Note: Gemstone production not available by group.

Figure 10. Nonfuel minerals produced by subregion, 1980-92, in order of value, in constant 1987 dollars.

The production of nonfuel minerals has been concentrated in a few counties in the ICRB. This is demonstrated in Figure 12. Twenty of the 100 counties in the region accounted for more than 90% of the nonfuel mineral production value over the period 1980 through 1992. The top six alone produced nearly 70% of the total, thereby containing the majority of the area's minerals sector. These counties include Shoshone, Id and Lincoln, MT in the Northern Rockies and Okanogan Highlands; Humboldt and Elko, NV in the Inter-mountain Semi-Desert; Silver Bow, MT in the Blue Mountains and Idaho Batholith; and Caribou, ID in the Yellowstone Highlands. The value of production in the top producing counties is shown in Table 5[7] for selected years

Click here to view Table 5

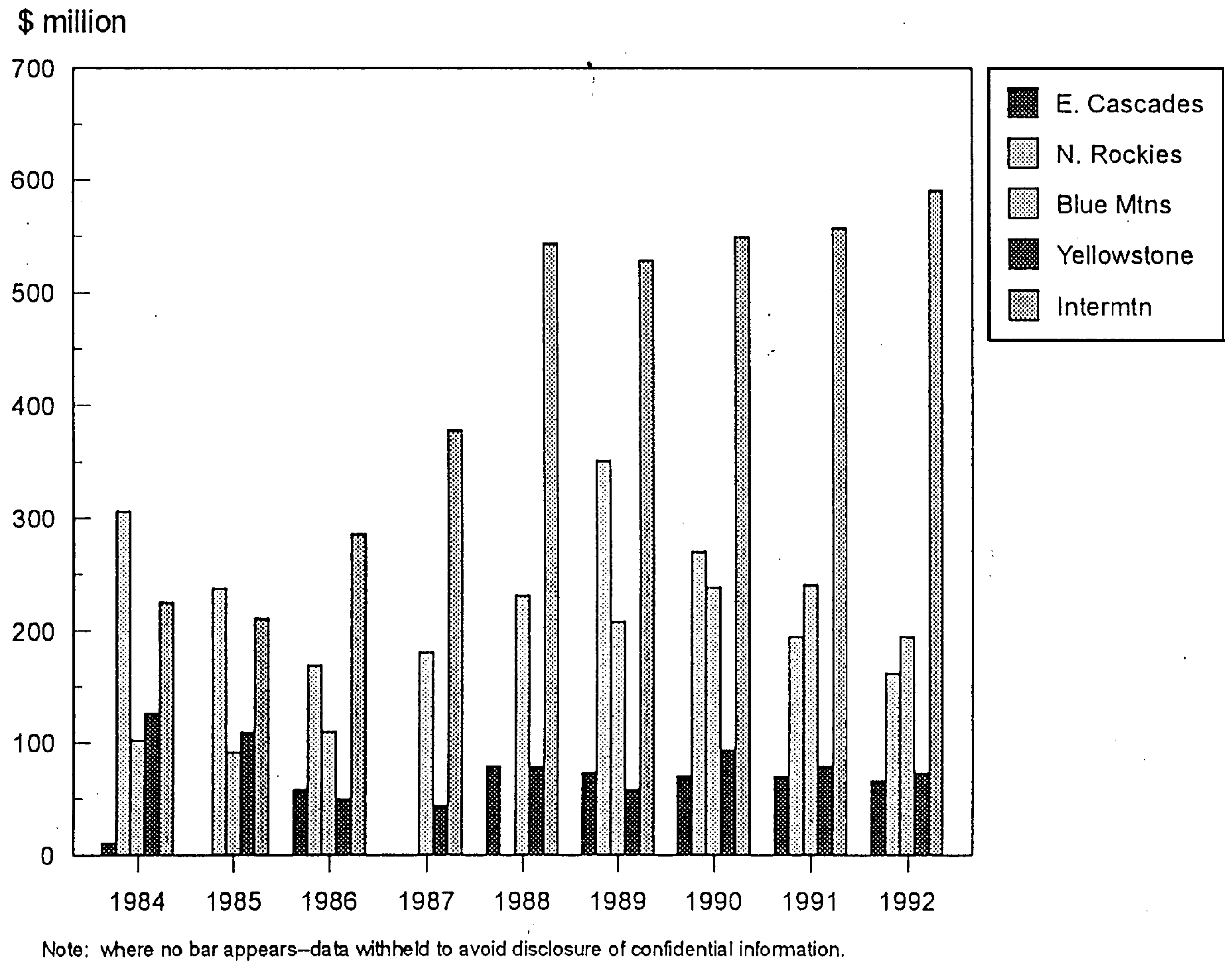

Figure 11. Value of mineral production in subregions, 1984-92, in constant 1987 dollars.

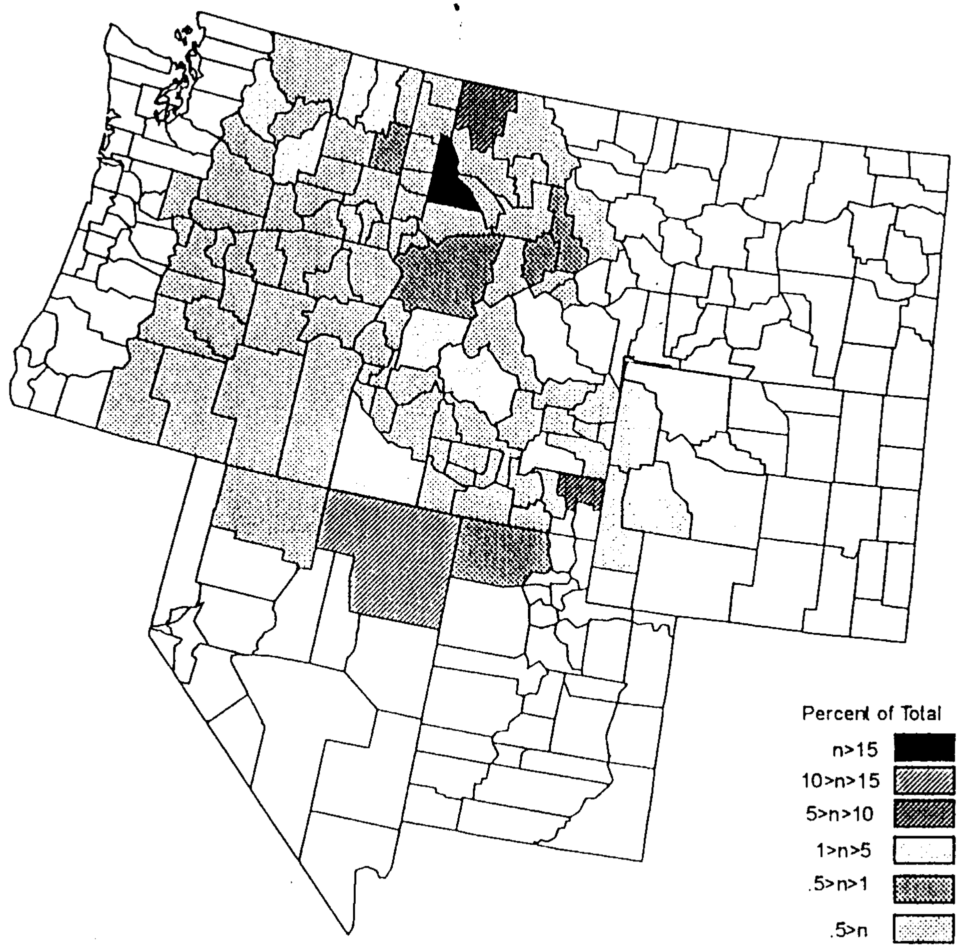

Figure 12. Production value, percent of Interior Columbia River Basin total in each county, 1980-92.

from 1952 to 1983. Most of the top producing counties are also the counties that have been dependent on the presence of mining for their economic well being over the years. As is illustrated in Tables 6 and 7[8], the mining sector has provided a high percentage of the employment and earnings generated within these counties.

While a few of the counties represented in the data are only partially contained in the ICRB, particularly two of the leading counties, in terms of value, in the region - Elko and Humboldt, Nevada, their contributions are included in the production totals of the ICRB and in the subregional divisions. This is done because their production could be seen as an indication of the potential of the surrounding Basin area.

County, State	Year							
	1969	1974	1979	1984	1989	1990	1991	1992
Caribou, ID	7.90	6.22	16.31	16.05	12.06	12.74	12.75	12.32
Custer, ID	7.36	6.37	4.67	21.77	na	na	na	13.22
Owyhee, ID	0.54	0.55	4.89	6.16	na	na	na	4.94
Shoshone, ID	30.63	28.72	27.34	27.96	24.24	23.82	14.89	10.82
Lincoln, MT	na	na	na	na	5.96	5.74	5.25	4.71
Silver Bow, MT	18.14	19.89	10.54	1.34	na	na	na	3.38
Elko, NV	2.04	2.38	3.05	6.38	6.55	6.89	7.30	7.15
Chelan, WA	0.12	0.09	0.15	0.21	na	na	0.66	0.63
Ferry, WA	5.97	4.82	4.53	na	na	na	13.50	12.24
Stevens, WA	3.36	2.18	4.70	1.89	1.21	1.27	1.65	1.30
na-not available								

Table 6. Mining employment as a percentage of total employment. See also Table A6.
na-not available.

Humboldt County, Nevada has become a very large mineral producing county. The modest production of a few million dollars worth of sand, gravel, stone, mercury, and clays throughout the 1950's, 60's and 70's was supplanted by very large production and value numbers during the 1980's as vast price increases and technological changes moved gold production to the

[8] *Source: REIS*

fore in the county. In 1992, five of the county's mines produced approximately 800,000 troy ounces of gold'. Given the average 1992 price, this represents a value of more than $275 million.

County, State	Year							
	1969	1974	1979	1984	1989	1990	1991	1992
Caribou, ID	11.59	21.07	30.37	33.14	20.58	21.68	23.95	23.01
Custer, ID	8.48	10.45	10.75	46.41	na	na	na	36.46
Owyhee, ID	0.58	0.46	12.10	15.75	na	na	na	12.03
Shoshone, ID	39.34	37.10	40.43	54.47	47.88	45.45	36.52	31.48
Lincoln, MT	na	na	na	na	9.66	10.23	9.05	8.40
Silver Bow, MT	27.48	31.60	19.30	3.43	na	na	na	6.43
Elko, NV	2.60	4.39	5.47	12.89	14.73	14.74	15.99	16.36
Chelan, WA	0.07	0.19	0.32	0.30	na	na	1.54	1.53
Ferry, WA	7.86	7:39	6.70	na	na	na	28.10	25.73
Stevens, WA	3.71	2.3	7.36	3.38	1.81	2.00	2.68	2.00
na- not available.								

Table 7. Percentage of total county earnings from the mining sector. See also Table A7.

The value and quantity of mineral production in Elko County, Nevada has increased dramatically since 1969. In that year, the principal mineral value came from sand and gravel. With the runup in metals prices that occurred in the late 1970's production of metals increased and, by 1984, gold led in value as it did in 1992. For example, according to the 1991 annual report of Independence Mining, 376,700 troy ounces of gold were produced at its Jerritt Canyon mine[10]. This change was accompanied by a large change in the composition of employment in the county. Mining went from representing 2% of both employment and earnings in the county to 7% and 16% of these, respectively.

Shoshone County, Idaho, a sparsely populated rural county in the north central part of the state, has a long history of substantial mineral production. While the county is no longer producing 60% of the mineral value for the state of Idaho (as it was in 1969), it still produces large amounts. The largest portion of this value has been from metals, particularly silver. Figure

[9] Lucas, J.M., Minerals Yearbook, Gold Ch., 1992, p. 549.

[10] Lucas, J.M., Minerals Yearbook, Gold Ch., 1991, p. 668.

13[11] shows the production of metals in the county frome the early 1900's through 1983. As can be seen in this graphic, the production of metals in the county has remained at high value, albeit with relatively high peaks and valleys over this period. This remains the case. Despite the depression in metal prices during the latter half of the 1980's, the value of silver production at the four major producers in the county remained above $50 million (1987 dollars) annually between 1985 and 1990. The mining sector in this county continues to be the largest single contributor to earnings, (3 1% of the total in 1992), more than the county's service and retail sectors combined which employ 40% of 'those working in the county. The sector is also still a leading employer at more than 600 persons or 10% of the total county workforce in 1992. The production value of the county as compared to the other leading counties in the region, from 1952 to 1983, is shown in Table 5.

Silver Bow County, Montana, is another county with a long history of mineral production. It has been a leading producer in the state and the region since the late 1800's. Metals represent a majority of this production and value. Figure 14[12] shows the production of gold, silver, copper, lead, and zinc in the county for the period 1909-1980. While the production of minerals has remained at a relatively high level, the mining sector no longer is the dominant employer it was in 1969 when it employed 18% of the workers and provided 27% of the earnings. It now represents 3% of the employment and 6% of. the earnings as other sectors have experienced growth in the county, particularly the services and government sectors.

Caribou County, Idaho, is, and has consistently been, a leading producer of phosphate rock in a state ranked third nationally in the production of this marketable commodity. This county is highly dependent on the mining sector for employment and income, and has become more so over time. In 1969, 7% of the jobs and 11% of the earnings came from this sector. In 1992, the&-percentages were 12% and 23% respectively. The mining sector follows only the manufacturing and government sectors in providing jobs and only manufacturing in providing income in the county.

Lincoln County, Montana became a large mineral producing county in the last half of the 1980's. At that time, the production of copper, gold, and silver provided a large increase in mineral value. The Troy facility is one of the largest silver and copper producers in the state. According to annual reports, the facility has produced between 3.5 and 4.3 million troy ounces of silver and between 15,000 and 18,500 tons of copper during the period 1985- 1989. Given average annual prices, this corresponds to between $46 million and $66 million annually. Prior to that time, the county had been producing relatively small amounts of the industrial minerals vermiculite, stone, sand, and gravel. The increased production led to the mining sector providing more than 4% of the jobs and 8% of the earnings in the county in 1992.

The production of magnesium during the late 1980's contributed significantly to the positioning of Stevens County, Washington among the top mineral producing counties in the region for the period 1980 through 1992. The production of uranium, a fuel mineral, also contributed significantly. Prior to 1987 and the very large values generated by the production of

[11] Source: USBM files

[12] Source: USBM files

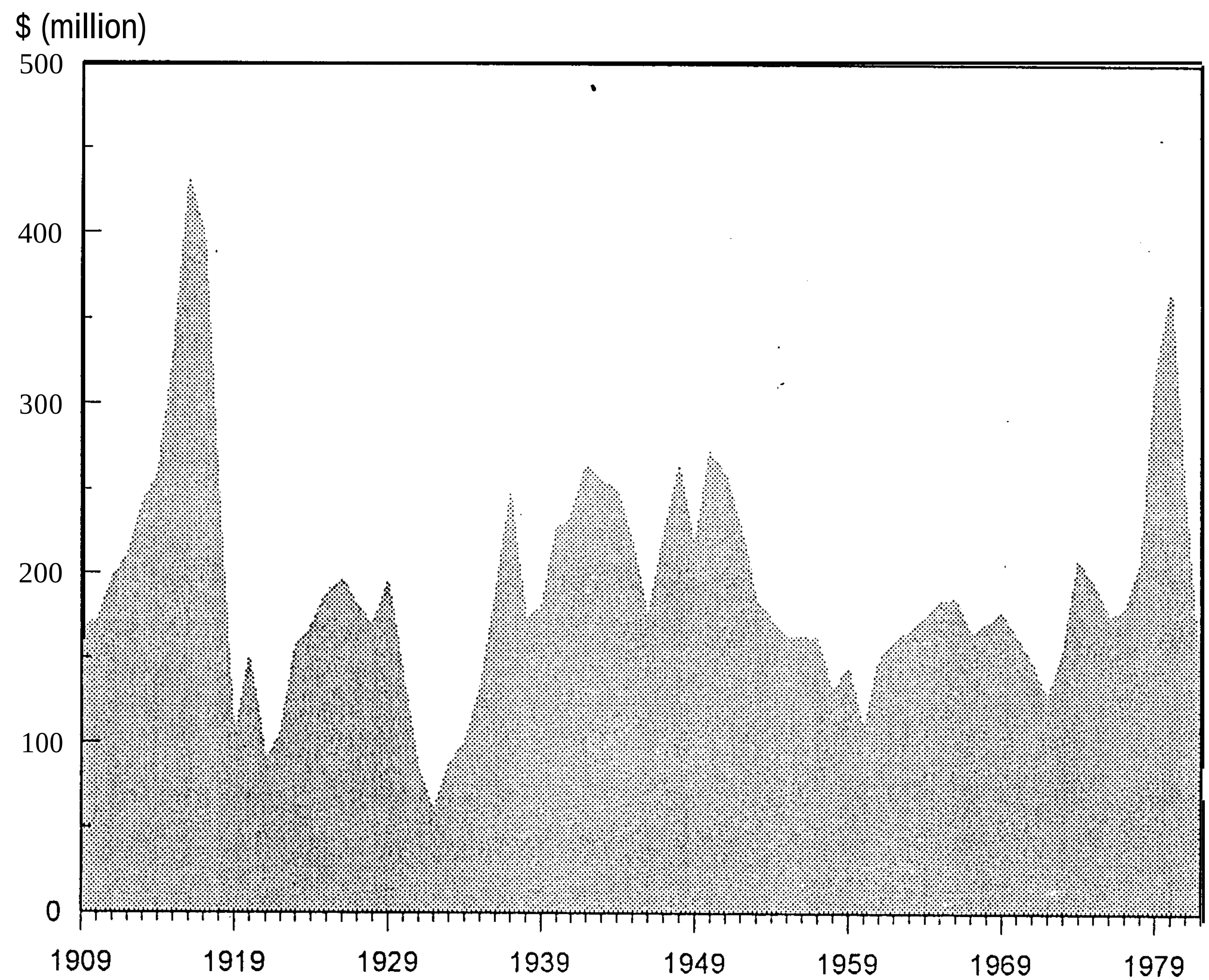

Figure 13. Value of gold, silver, lead, and zinc production, Shoshone County, ID, in constant 1982 dollars. See also Table A8.

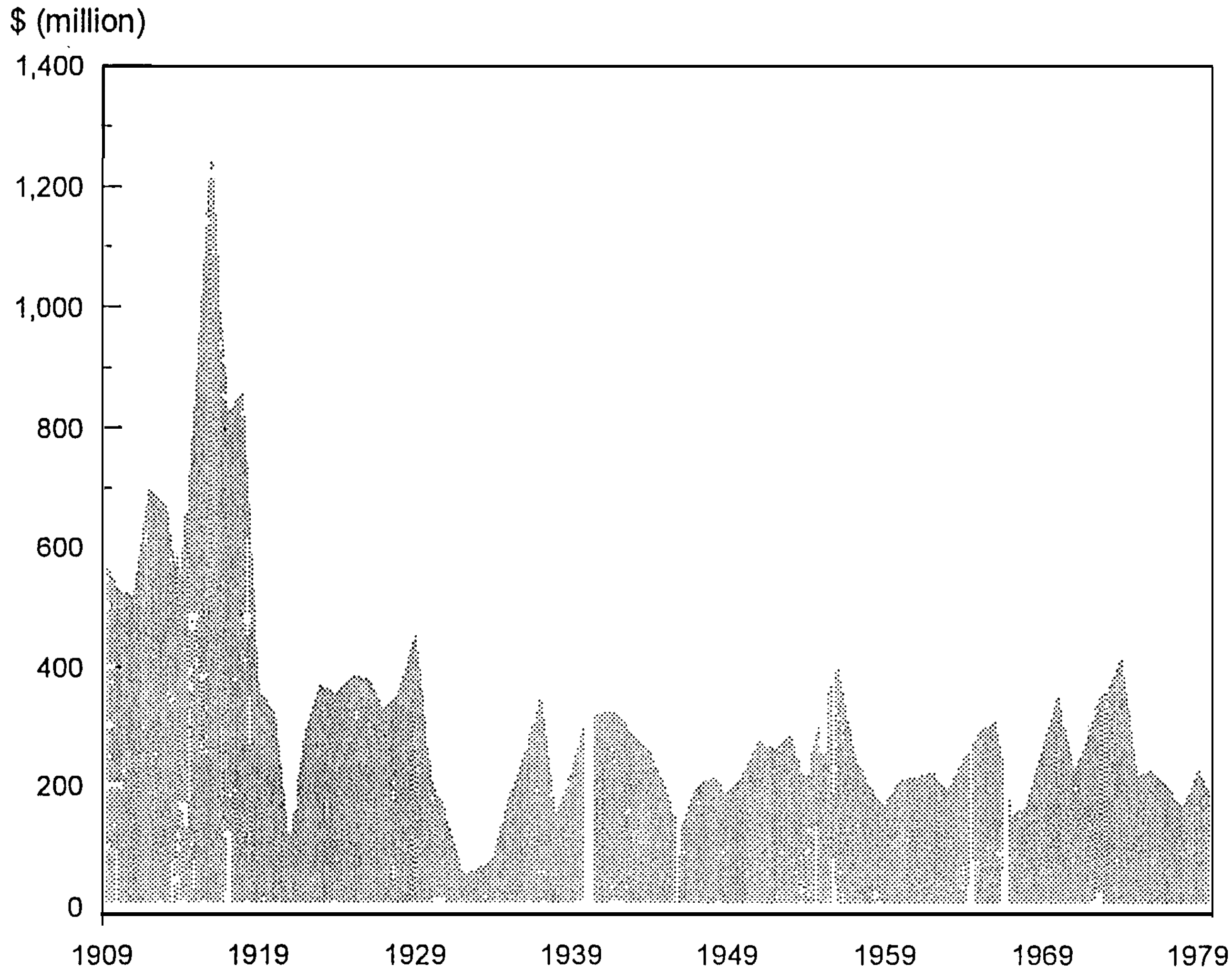

Figure 14. Value of gold, silver, lead, and zinc production, Silver Bow County, MT, in constant 1982 dollars. See also Table A9.

magnesium, uranium was the leading mineral produced in the county.

The dramatic increase in gold production in the mid 1980's accounted for the appearance of Chelan County among the top producing counties in the region. Until the increase, the county's production consisted mainly of sand, gravel, and stone.

The production value of nonfuel minerals increased greatly in Ferry County, Washington from 1952 to 1992. By 1969, the county was the leading producer of gold and silver in the state but it was still quite a small amount. The higher gold price led to greater production and by 1992 the production value in the county had increased more the ten times in size. The increased importance of mining can also be seen in the employment and earnings numbers. The mining sector increased from 6% of employment and 8% of earnings to 12% and 25%, respectively, positioning the sector as the leading producer of earnings and behind only government and services in the provision of jobs.

Owyhee County, Idaho produced a very small amount of minerals in 1952, valued at less than $21,000. The majority of this from the production of sand and gravel. During the 1980's, the production of gold and silver in the county moved it into the top ten producing counties in the region.

Custer County, Idaho went from modest production to a large portion of the regional value with the opening of a molybdenum mine in 1984. The opening of the mine greatly increased the dominance of the mining sector in producing employment and earnings in the county, going from 7% and 8% in 1969 to 13% and 36%, respectively, in 1992. This positioned the mining sector as the leading generator of earnings and behind only government, services, and retail trade in number of jobs provided.

While not included in the most recent years shown in the production value figures and tables, fuel mineral production provides much value, employment, and earnings in some counties in this region. For example, the Wyoming counties of Fremont and Lincoln are considered mining counties in BEA terms, and Fremont is among the top mineral producing counties in the region. Mineral production accounted for much of the employment and earnings in these counties. At its peak, around 1980, the mining sector was providing more than 20% of the jobs and more than 38% of the'earnings generated in Fremont County. The majority of the mining sector in these counties is the production of fuel minerals, including uranium.

Another very important aspect of the minerals industry of the Interior Columbia River Basin is aluminum reduction. Aluminum reduction is a large worldwide industry with a significant portion of the world production coming from the United States, particularly, the Northwest. Although world economic conditions and increased foreign production capacity affect aluminum prices (Figure 15) and thus can cause production fluctuations; the smelters of the Interior Columbia River Basin continue to produce significant amounts of aluminum. There are five aluminum smelters located in the interior basin: ALCOA in Wenatchee, WA; Kaiser in Mead, WA; Columbia Aluminum in Goldendale, WA, Columbia Falls Aluminum Co. in Columbia Falls, MT; and Northwest Aluminum in The Dalles, OR. Figure 16 shows the operating capacity at these plants in relation to the rest of the U.S. As can be seen, these plants have had between 16.7% and 20.6% of the U.S. operating capacity available since 1981.

Mineral Trade Patterns

The trade patterns of the mineral-related products produced in the ICRB are almost as varied as the number of commodities produced. Locatable minerals such as gold, silver, lead, zinc, and copper are what comes to mind, but phosphate, sand and gravel and other industrial minerals are also an important part of mining in the ICRB. In the past, when much of the gold was from small placer operations, a large portion of the gold was probably bartered directly within in the ICRB. Small miners would more than likely go to the nearest center of trade and market their gold for materials and supplies. This local trading of the "final product" encouraged development in the ICRB. Even after larger outside companies began financing operations, many times shipping the precious metals and/or precious metal concentrate outside of the region, workers still needed to be paid and supplies still needed to be purchased.

In the past, producers of base metals-copper, lead, and zinc-operated smelters and refineries throughout the ICRB. Some of best known processing centers include the Clark Fork drainage from Butte to Anaconda, MT, and the Coeur d'Alene Mining District in Idaho. All base metal smelters within the ICRB study area have been closed for economic and/or environmental reasons. Two smelters continue to operate in the surrounding area: a lead smelter just across the Continental Divide in East Helena, MT, and a zinc smelter at Trail, British Columbia. along the Columbia River, just across the Canadian border. Some minerals, such as crushed stone and construction sand and gravel, are high-bulk, low-value commodities that are generally consumed near point of production. Partially the result of transportation costs, one can assume that most aggregates produced in the ICRB are either consumed in the ICRB or the Portland-Puget Sound corridor. In the three state area of Idaho, Oregon. and Washington, aggregates accounted for 41% of the States total mineral production in 1992.

Like base metals in the past, phosphate rock not only impacts the ICRB as a mined product, but value-added processing also has significant economic influence. At a value of $84 million, Idaho was the Nation's third-ranked producer of marketable phosphate, all produced within the TCRB. None of the Idaho phosphate producers marketed phosphate rock as a salable commodity. Except for one producer, which shipped ore to its phosphate plant in Montana (still within the ICRB), all phosphate rock is made into-elemental phosphorus or various grades of phosphoric acid in southeast Idaho. According to the Idaho Geological Survey, the value of phosphate rock increased in 1992 from $16 per metric ton to $106 per metric ton as a result of value-added processing ([10]).

Some commodities, such as lime, are produced to support other ICRB industries: an eastern Oregon limestone producer uses lime in the production of cement and also sells lime to sugar producers in Idaho's Treasure Valley. One consideration of a new lime producer was its accessibility to gold producers using heap leach technology (a consumer of lime). In southern Idaho, local lime production is used to make fertilizer and as an animal feed supplement. A Native American tribe markets lime to a paper plant in Lewiston, Idaho.

Although bauxite, the raw ore that is used to make alumina and then further processed to make aluminum, is imported from Australia, Jamaica, and Suriname ([11]), aluminum smelters and rolling mills in the ICRB produce vast amounts of finished aluminum for national and international markets. Partially the result of aluminum reduction being energy intensive, and the

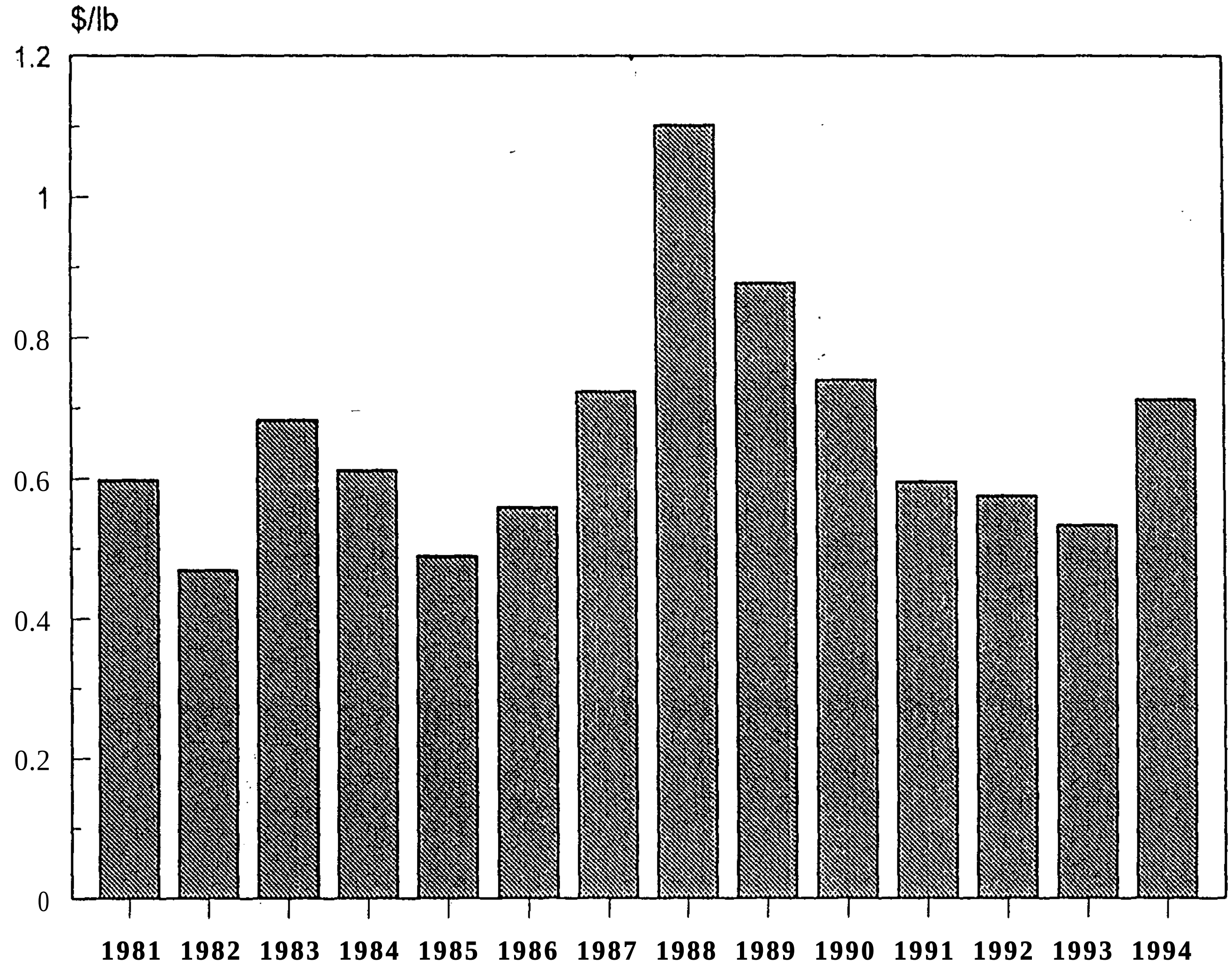

Figure 15. Aluminum--U.S. market spot price, annual average, 1981-94.

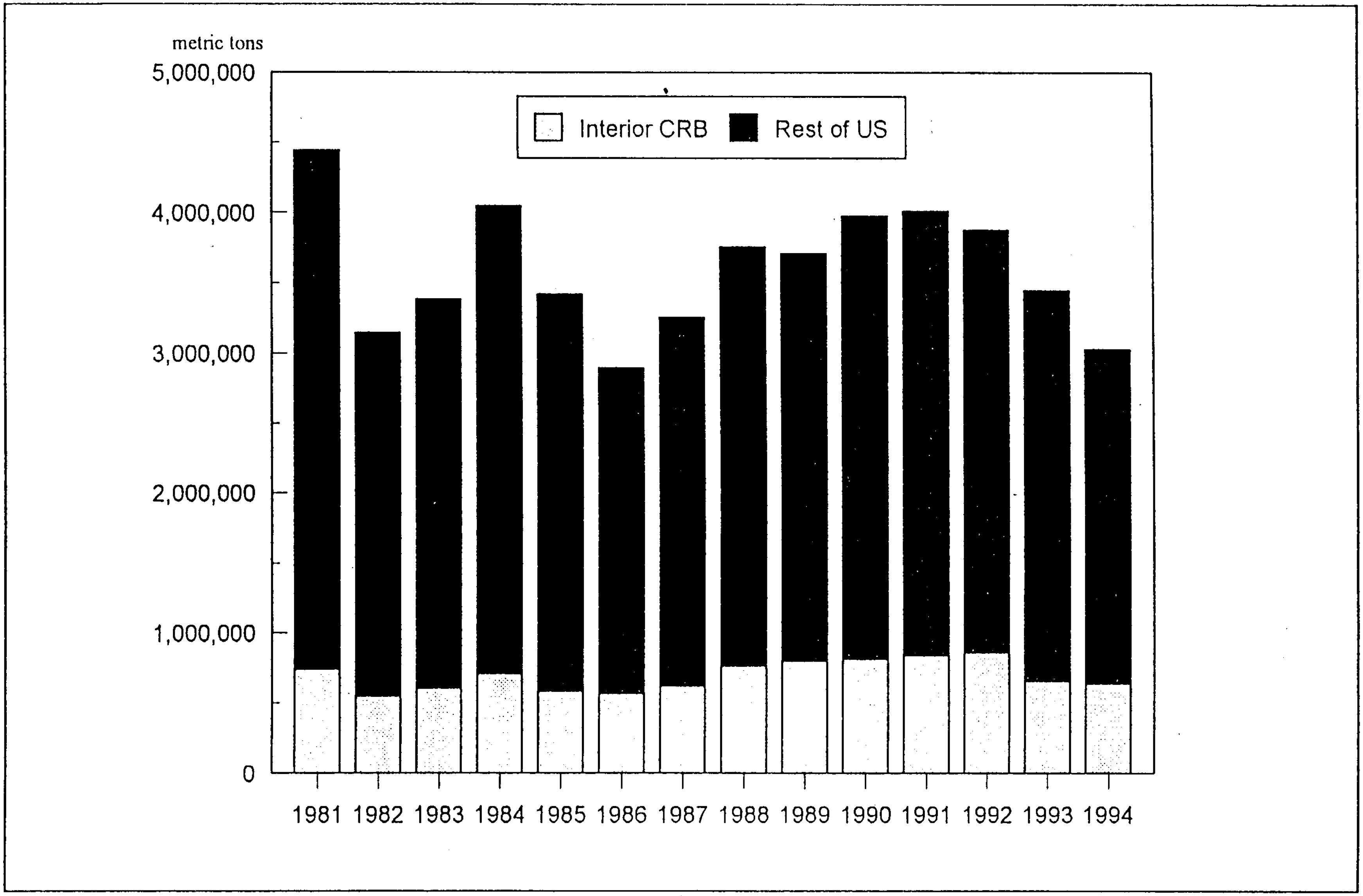

Figure 16. Operating aluminum smelting capacity in the Interior Columbia River Basin and the rest of the U.S.

relatively low costs and availability of hydropower in the Northwest, 39% of the Nation's aluminum smelter capacity was located in the Northwest as a whole in 1992 (12), approximately half of this within the ICRB. Also in 1992, aluminum production in Washington State was valued at about $1.6 billion, approximately 31% of the Nation's total production, and over 3 times the State's total mineral production value.

Significant Known Deposits

The starting point for this assessment of significant mineral locations in the ICRB was the Bureau's MILS database. "Significant," as defined here, includes those mineral facilities now in operation, in development, or maintained in standby status.

Using MILS and other sources of information, 207 significant mineral locations were identified in the ICRB. At the time of the assessment (1994), 186 sites were in operation, 11 under development, and 10 maintained on standby. The 207 sites represent more than 16 metal and industrial mineral commodities. The results of this assessment are summarized in Table 8, and their locations are identified in Figure 17.

Of the 207 sites identified, most are small operations with annual production of less than $10 million. Large operations are those that have a major impact on the local economy. For purposes of this study, it was assumed that properties with annual production of greater than $10 million would be considered "large." Only 24 sites (Table 9) in the study area have production greater than $10,000,00 per year (1992 data). However, the value of production from these 24 sites totalled more than $2 billion. The production of finished aluminum through smelting has, by far, the largest mineral economic impact on the region, even though no raw aluminum ore is mined in the ICRB.

Eleven deposits are under development. These represent deposits which will most likely have greater than $10,000,000 per year of production. The deposits are at present under construction or will be so in the near future.

The 10 deposits on standby are all major past producers (over $10,000,000 per year); millions of dollars per year are spent by private companies just for maintenance. Should commodity prices increase, even by moderate amounts, the 10 deposits would be brought back into production.

From Table 9, it is apparent that mineral activities are numerous in the ICRB and are found throughout the region. The table also shows that r-nines with major economic impacts are limited to a small number of operations (24). These operations, however, generate a great deal of income for employees, suppliers, and owners (greater than $2 billion per year). Several commodities are produced on a large scale, but aluminum production has by far the greatest economic impact.

FUTURE MINERAL ECONOMIC ACTIVITY

Future mineral economic activities in the ICRB will include exploration, development, and abandoned mine and mill site reclamation and remediation. These activities will be influenced by several factors, including economic costs and commodity prices, land use or other

Click here to view Table 8

regulatory requirements, risk assessments and perceptions, and the existence of mineral deposits. These factors are discussed below, with emphasis on the areas where mineral deposits are most likely to be found.

Economic and Regulatory Influences

Mining and Mineral Markets

Mining tends to be a capital intensive industry with a large share of capital expenditures occurring early in a mine's life. Mines tend also to be long term commitments, with development times (including environmental studies and permitting) of up to 10 years and projected operations extending up to 30 or more years beyond that. Because of the large

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[13] Includes one smelter just outside of the ICRB boundary.

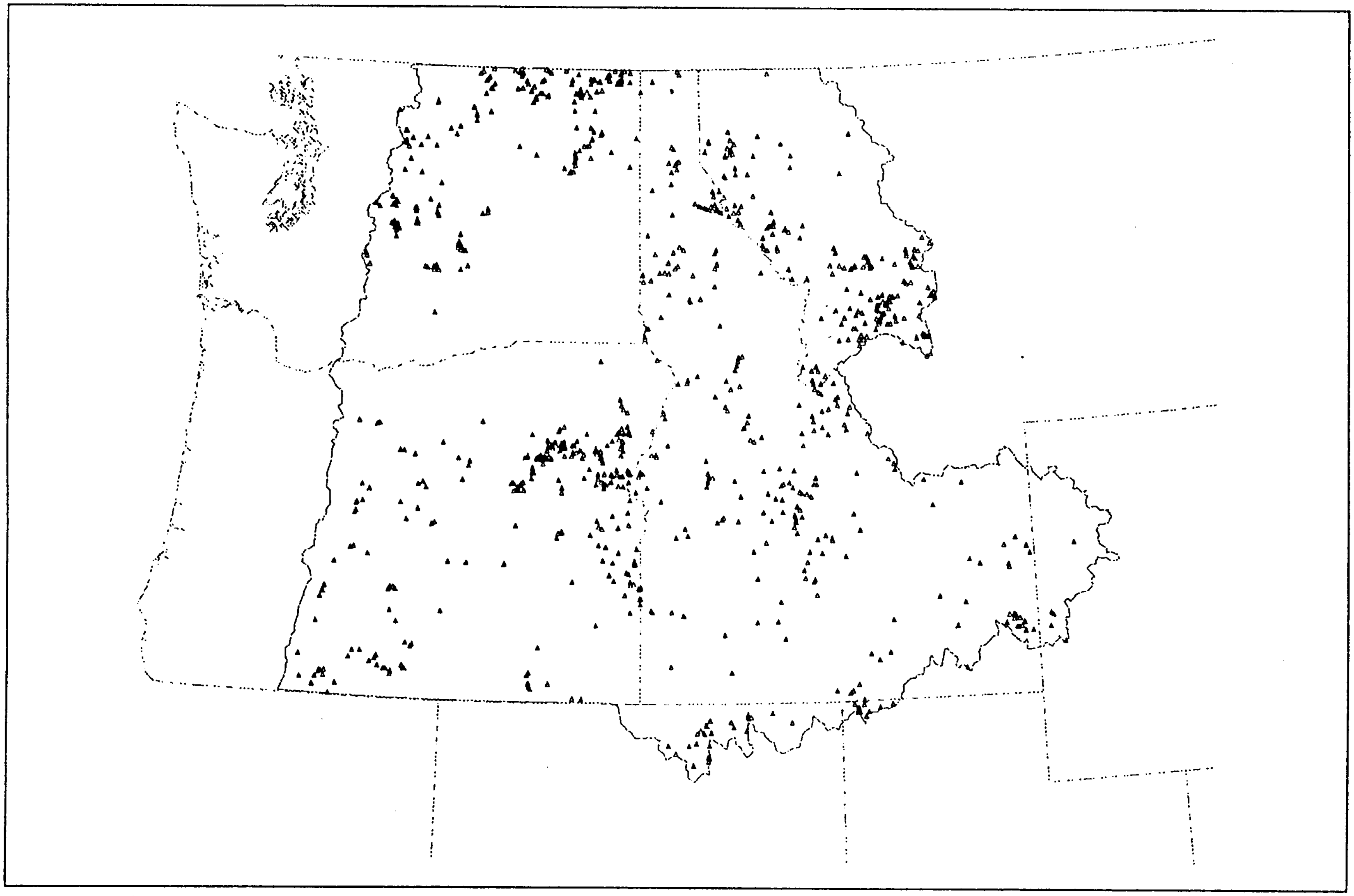

Figure 17. Significant mineral locations in the Interior Columbia River Basin.

Commodity	Sites	Percent of mineral output
Au-Ag	10	17.68
Aluminum smelters	6	69.68
Copper	2	7.91
Diatomite	1	0.59
Limestone	1	0.49
Molybdenum	1	1.43
Phosphate	3	2.22
Total	24	100.00

Table 9. Mineral sites with greater than $10,000,000 output in 1992.

commitment and long life, expectations about commodity prices are important components in mining decisions, and a relatively high rate of return is required to offset these risks. A mineral deposit is economically recoverable if long term price expectations are high enough to offset the costs of recovery and any necessary processing. Thus, known deposits may move into and out of the category of economically recoverable with shifts in prices, technology, or expectations, and areas with mineral potential may become more or less attractive for new exploration for the same reasons. Beyond these basic considerations, it is important to distinguish between markets for mine products that are essentially local, and those that are global.

Markets for construction materials-sand, gravel, aggregates-are usually local; the material is typically not difficult to find and the product is high in volume, but low in unit value. Such mines are often unpopular with residential neighbors, but because some of the largest variable costs are for transporting the product to consumers, there is a strong incentive to keep operations close to demand, e.g., urban areas or highways. The rock removed is the product, there is little processing of the material before use, and environmental issues are usually'associated with dust, sedimentation, and visual and noise impacts. The pit or quarry-left behind has, in some past cases, become a safety or environmental hazard; More recently, they are reclaimed for various purposes including recreation and habitat. The economic consequences of prohibiting such mining in specific locations would not be large (other than to the owner), because other nearby sources are' likely available. Prohibiting such activity across broad areas can have important regional economic impacts by limiting economic growth or increasing the costs of a basic input to the economy. Two more recent trends are also affecting this issue as well: streams and rivers, often a source of such materials, are increasingly protected for environmental purposes; and design specifications for such materials in building and road construction, are increasingly restrictive, reducing the number and size of deposits that are both available and economically attractive.

Sand and gravel are used primarily for construction purposes, mainly as aggregate in concrete; as road base material in the construction and repair of highways, railways, and runways;

and as aggregate in asphaltic concrete for paving highways and streets. Crushed stone can substitute for sand and gravel in most applications, operations are generally longer lived, can afford greater capital investment, and can be located somewhat farther from the market. However, because of the high cost of transportation and the large quantities of bulk material that have to be shipped, it is usually marketed locally ([13]). Figure 18 shows sales and use of all sand, gravel, and stone (including industrial sand, gravel, and dimension stone), along with population, by county. As can be seen, the more densely populated counties tend to have higher production values for sand, gravel, and stone.

Sand, gravel, and stone form the basis for infrastructure and other construction activities. It is estimated that about 11 tons of stone, sand, and gravel are produced per capita on an annual basis in the seven state area encompassing the ICRB. Any economic or population expansion in the region will be accompanied by increased demand for these construction materials, increasing the need for production at currently operating sites and the introduction of new sites.

By contrast, markets for metals (e.g. copper, gold, or zinc) are more global, deposits are relatively rare, and the product is low in volume and high in value. Processing, to separate metal from ore and refine the metal, is a significant proportion of total costs, and can have important environmental implications. There is a strong incentive to process ores as close to the deposit as possible so that only the highly valued product is transported. For those mines which are large surface operations, any material covering the deposit (the overburden) is removed for mining and set aside for later reclamation. Large quantities of ore may be mined and processed, and with the metal content of ores often less than 1 or 2 percent, large quantities of material are generated and returned to the site. Both mining and processing are subject to a variety of environmental controls under federal and state laws, and it has been argued that increasingly stringent environmental requirements in the U.S. are encouraging the mining industry to shift more and more of its exploration and production activities to other nations. If so, or if such mining is prohibited for other reasons, there can be large opportunity costs in the form of lost income, employment, and taxes. However, because any single mine usually contributes a small fraction to total world production, prices for these commodities or products that contain them are not likely to be affected. The minerals (other than sand, gravel, and stone) that generate the largest value in the ICRB (See Figure 8) are briefly discussed below.

Gold is used in a variety of applications including the manufacture of jewelry, dental appliances, and as an industrial metal used in solid state electronics, industrial control and monitoring instruments, and corrosion resistant chemical process equipment([14]). Because it is also a long-established store of value, the price of gold is driven not only by global supply and demand, but also political, economic, and social conditions. New exploration technologies, and a substantially improved understanding of the geology of gold deposits, have contributed greatly to the further development of past producing areas and to the discovery of new deposits. Advanced extraction and processing technologies currently allow economic recovery of gold from ore containing as little as 0.1 troy ounce of gold per ton of ore (less than 1/100th of 1%). The recent prices of gold, fluctuating between $350 and $400 per troy ounce, are high enough to generate continuing strong interest in low grade deposits throughout the country.

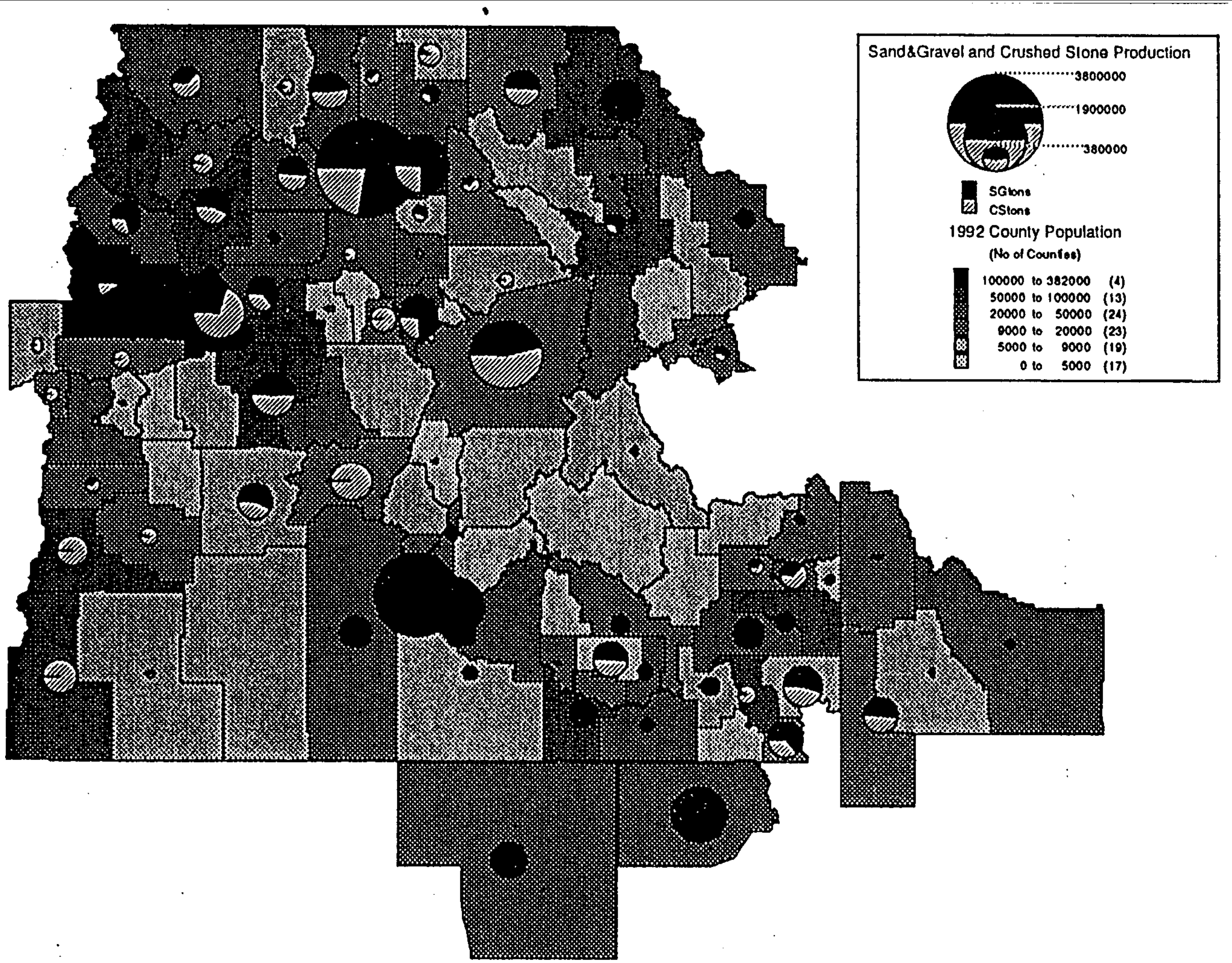

Figure 18. Sand, gravel and stone production and use; and county population, 1992

Copper possesses qualities that make it and its alloys very attractive for electrical transmission, water tubing, castings, and heat exchangers (15). In the United States in 1992, 40.5% of the copper consumed was in building construction and 24.4% in electrical and electronic products (16). Copper is also an internationally traded commodity with its price broadly reflecting the worldwide balance of copper supply and demand.

The most important use of silver is in photographic materials. Silver is used in the manufacture of film, photographic paper, photocopying paper, x-ray film and photo offset printing plates, among other uses. It is also used in electrical and electronic products, sterling and electroplate ware, jewelry, and brazing alloys and solder (17).

Molybdenum is a refractory metallic element used primarily as an alloying agent in steels, cast irons, and super alloys to enhance hardenability, strength, toughness, and wear and corrosion resistance.

Lead is used primarily in storage batteries. Approximately 81% of the domestic lead consumption in 1992 was for this use.

Zinc is used extensively in the automobile and construction industries for corrosion protection and remains the most cost effective means of protecting steel against corrosion.

Aluminum has a variety of uses from beveragecontainers to aircraft and specialized marine crafts.

The phosphate rock produced in the region is used primarily in the manufacture of fertilizer for both national and international markets.

Environmental and Regulatory Requirements

Existing policies can affect a decision to mine in a number of ways, most notably through land use and environmental restrictions. Particularly on public lands, policy over the last several decades has resulted in a reduction of the lands available for exploration and development. Other policies, including those listed below, have reduced options or increased the costs of mining. Finally, increasing demands for recreation and wilderness experiences will likely increase pressures to limit or prohibit future mining.

The new regulatory environment has developed in an effort to ensure that present and future mining operations will not produce the same environmental consequences as past mining practices. However, an important concept to consider when reading this information is that the cost, health, or environmental effectiveness of current regulations is, in many cases, unproven.

Since 1970, mining operations have been required to comply with increasingly complex environmental regulation and reclamation standards that have stemmed primarily from Federal environmental legislation. The comerstones'for current Federal. State, and local environmental regulations and standards are the National Environmental Policy Act (NEPA), Clean Water Act, and Clean Air Act. Contemporary Federal. State, and local mining regulations, environmental standards, and reclamation requirements have evolved and are designed to minimize and/or eliminate the physical, chemical, and biological impacts associated with current mining and mineral processing facilities.

A partial listing of Federal legislation that apply to proposed mining operations includes:

- National Environmental Policy Act (NEPA);
- Clean Water Act (including National Pollutant Discharge Elimination System, Section 404-Dredged and Fill Material Permit, Non-Point Source Program, and Oil and Hazardous Substances Spill Program);
- Clean Air Act (including General Air Quality Permit, Prevention of Significant Deterioration Program, and Non-Attainment Program);
- Safe Drinking Water Act (including Underground Injection Program);
- Endangered Species Act;
- Migratory Bird Treaty Act;
- Toxic Substance Control Act;
- Emergency Planning and Community Right-to-Know Act;
- Mine Safety and Health Act;
- Occupational Safety and Health Act;
- Historical and Archaeological Data Preservation Act;
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and
- Resource Conservation and Recovery Act (RCRA).

Prior to 1970, mining and mineral processing were conducted with limited environmental awareness or regulation. It was acceptable practice to allow nature to reclaim minesites with little or no assistance from mine operators or others. Mine waste dumps, ore stockpiles, and tailings impoundments were located based on convenience which often meant in the bottom of stream or river drainages. In some cases, mineral beneficiation waste, including reagents, chemicals, and waste rock were dumped directly into drainages. During this era, the implications for long-term environmental damage and/or health hazards resulting from mining disturbances were not widely known or understood.

The potential problems generated by past mining have received increasing attention. The identification, reclamation, or remediation of abandoned mine and mineral processing sites has become a high priority in land management and regulatory agencies ‘at both Federal and State levels. These actions may represent significant economic activity in the region over the next several decades. Information on the number and location of known sites of abandoned mines or processing sites was provided in a prior section, and initial estimates of cost are provided below.

Management of Mineral Resources on Public Lands

Mineral exploration and development on Federally owned or managed lands are governed by a variety of laws and regulations. As one result, collecting and analyzing data and information concerning minerals can be complex and error prone. This overview of this issue addresses some of the implications for analysis and resource development It does not provide detailed information on Federal lands, minerals, or laws, some of which is available through the Bureau of Land Management, other Federal agencies, state and local governments, and the references. Much of the following discussion is taken from these references,

Federal lands may be either Public Domain or Acquired. Public Domain lands are those originally “gained by conquest (from the English Crown and from Mexico), by purchase (from

France, Spain, Russia, and Mexico), and by treaty (with England)"(18). With some exceptions, lands otherwise owned by the Federal government are designated "Acquired Lands." As of 1991, the Federal government owned 649 million acres or 28.6% of the total land area in the U.S. Of the Federally owned lands, 587.6 million acres were Public Domain and 61.8 were Acquired. In Washington State, 12 million acres (28.3% of the total) are owned by the Federal government; in Oregon, 32 million acres (52.4%); in Idaho, 33 million acres (61.6%); in Montana, 26 million acres (28.0%); in Utah, 34 million acres (63.9%); and in Nevada, 58 million acres (82.9% (19). These acreages change slightly from year to year as a result of new purchases, exchanges, and sales.

"Although there are numerous laws and amendments applicable to minerals management, four are of particular importance: the Mining Law (1872), the Mineral Leasing Act (1920), the Mineral Materials Act (1947), and the Mineral Leasing Act for Acquired Lands"(20). The Mining Law, the earliest of the four, encouraged exploration and development on Public Domain lands, designating most minerals "locatable," referring to the freedom of individuals to find and exploit mineral deposits. If a deposit is found, the discoverer may stake a claim (giving the claimantthe right to access and develop the deposit) and subsequently patent the claim (transferring ownership of surface and subsurface to the claimant). The number of patents and the yearly and cumulative acreage patented are shown in Figures 19 through 21. The total acreage transferred through the patenting process as of 1992 was approximately 3.24 million acres, or 1/2 of 1% of total Federal lands.

The Mineral Leasing Act and the Leasing Act for Acquired Lands designated some minerals on Public Domain lands (notably energy and some non-metals), and all minerals on acquired lands as "leasable." In general, anyone may apply for exploration permits and, if a deposit is discovered, a lease may be granted for its development. Bids for leases and royalties on production may generate revenues to the government. Finally, the Mineral Materials Act designates some "common" minerals as salable. In these cases, the land management agency may allow exploration and development through permits and sales.

Not all Federally owned land is open to mineral exploration and development. Some lands have been designated as Wilderness Areas, Wild and Scenic Rivers, or other special purpose categories. In these areas, mineral (and other) activities are precluded or constrained to varying degrees in order to preserve special characteristics.

In addition to the above, there are two significant other complications in the management of mineral resources on public lands. The first is the existence of valid mining claims on lands that have subsequently been withdrawn from mineral entry. Generally, the claims and patent rights remain valid. However, mining plans, access rights, and other activities are typically subject to more rigorous review and adjustment. The second is the history of ownership and the possibility of split estate-that is split ownership of the surface and subsurface resources. This frequently happens when an owner sells the surface but retains rights to one or more minerals that may (or may not) exist below the surface. In some cases, Federally owned land has been sold and later repurchased or otherwise reacquired, with mineral rights kept by an interim owner. In others, subsurface resources are Public Domain but the surface is Acquired. Most commonly, the government retains mineral rights to lands conveyed to the private sector. "There are, unfortunately, almost endless variations on this theme. A parcel of land may be subject to a mix of Federal (Public Domain or Acquired), Reserved, outstanding, fractional and/or future rights, each applying to a different resource or a different part of the sarne deposit"(21). Finally, it should be noted that mineral deposits do not conform to land management agencies' boundaries. A deposit may exist beneath the lands administered by multiple Federal and State agencies, Native American and privately owned lands.

The consequence of all of the above is not just a difficulty for the administration of minerals for the land management agencies; it also means that the collection of reliable data and information concerning mineral production on Federal lands'is complex and, in some cases, perhaps impossible. For example, a deposit may be partially beneath Forest Service and partially beneath private lands. Measuring the proportion of daily production associated with each type of land is a non-trivial task and often not legally required. If the deposit of locatable minerals (i.e. covered by the Mining Law) is on Public Domain lauds, there is no general requirement that production statistics be reported to the Federal government. If a claim on Public Domain lands was patented, any production is no longer from Federal lands (even though it may be surrounded by such) and no statistics need be reported. The possibility of split ownership, possible mixtures of Public Domain and Acquired lands, withdrawn status but prior. existing claims can result in lawsuits concerning which land management rules apply, much less what data needs be reported. And while the U.S. Bureau of Mines and others collect a variety of data concerning mineral production, it is often voluntary and usually not reported by land ownership categories.

It is estimated that in 1991, about 9% ($1.8 1 billion) of domestically produced hardrock minerals were locatable minerals from Federal lands. A larger share of domestically produced metals (16% or $1.59 billion) other than industrial minerals (3% or $0.22 billion) came from Federal lands.

The above considerations also cause problems for projections of future mineral exploration and development: although mineral geology and past mining are useful indicators of where future deposits may be found, the likelihood of economically recoverable deposits and the markets for mineral products can be overshadowed by complex patterns of interests and ownership, and the potential for conflicts among multiple stakeholders.

Mineral-related economic activity will occur in the future in the ICRB for one or more of at least three reasons: because there will be a continuing need for sand, gravel, and other construction materials, the amount directly related to the size of the region's population; because there are mineral resources in the region, needed as inputs to world industry and economically recoverable given reasonable assumptions; and because environmental problems caused by past mining and processing must, under current law, be remediated. The timing of these activities will be determined by economic, social, and regulatory factors. Their location will be largely determined by the region's geology and mining history.

Mining only occurs where there are (or were), in fact, mineral deposits. Past exploration activity and geological surveys have identified many deposits-not all of which have been mined-and yielded indications of where, given our current understanding, future discoveries seem more or less likely. Collectively, this information can be quite useful in anticipating where, and under what circumstances, mineral economic activity may occur. Three indicators are useful in discussing the potential for future mining: known mineral deposits; areas in which the development interest is already apparent (including those locations where mining has

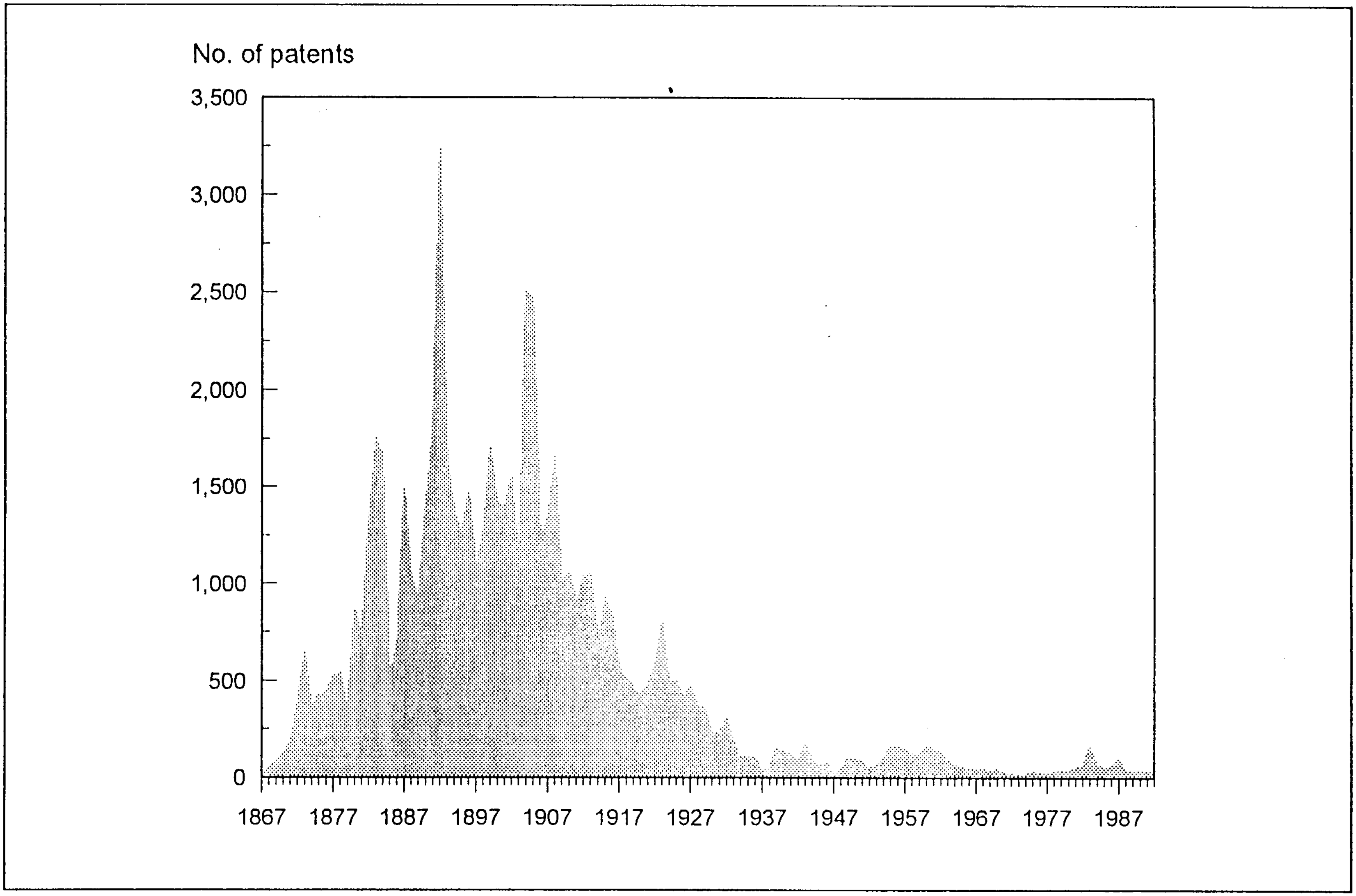

Figure 19. Mining patents issued--1867-1992.

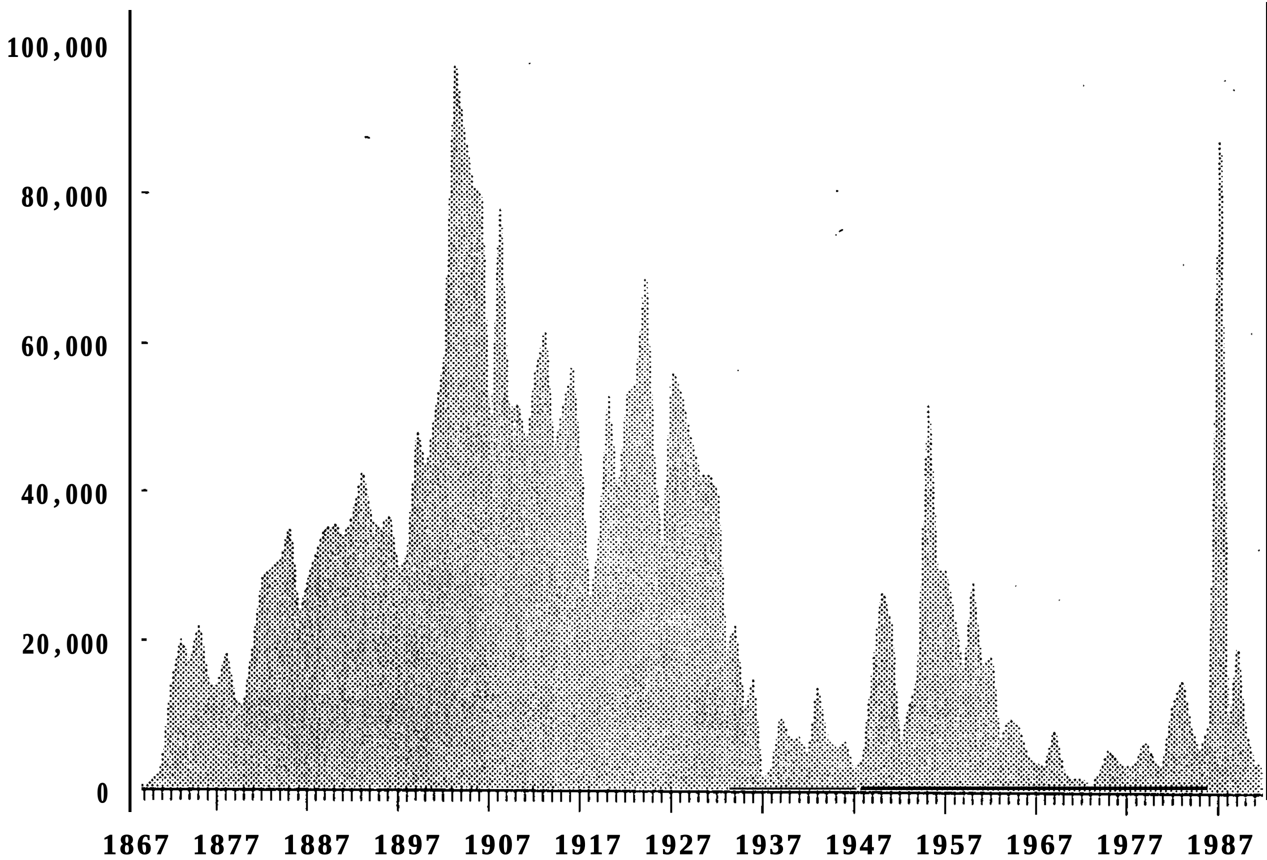

Figure 20. Acreage patented by year 1867-1992.

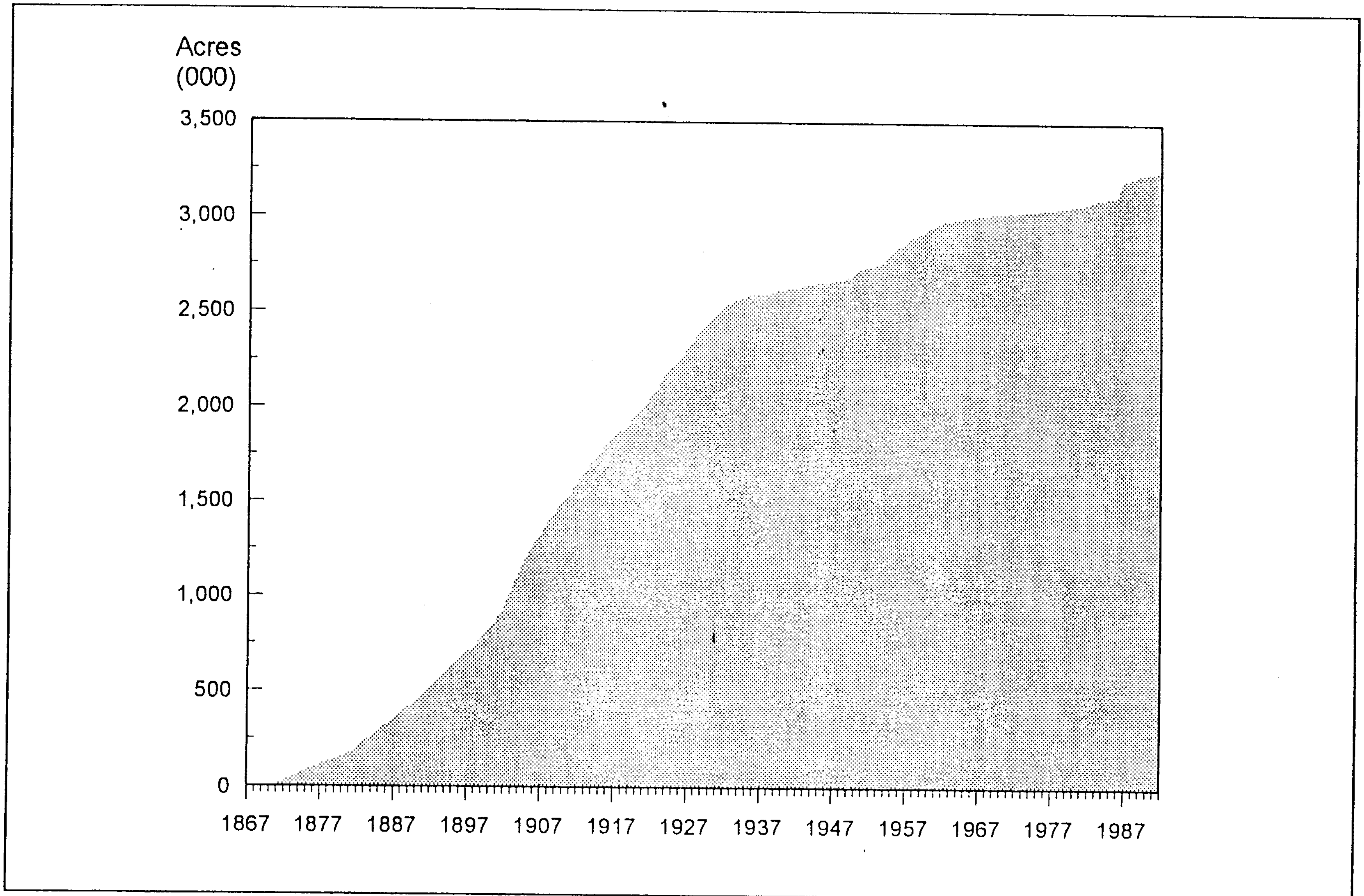

Figure 21. Cumulative acreage patented--1867-1992.

occurred in the past); and areas in which the geology seems suitable for the existence of deposits not yet discovered.

Remediation of Abandoned Mineral Sites

Under existing provisions of the Clean Water Act and other laws, one of the most certain types of mineral economic activity will be the remediation and reclamation of abandoned mine and mineral processing sites. Such sites exist throughout the nation, but are concentrated in the Western States. As discussed above, there are almost 14,000 sites in the ICRB, with hundreds likely to require remediation. The expenditures required for these activities, while uncertain, will have local and regional economic impacts.

The primary uncertainties in the remediation and reclamation of abandoned and inactive mines are the costs and standards for cleanup, two complex and intertwined topics; The technologies for addressing physical hazards are relatively well-known and straightforward, but those applicable to chemical problems are more problematical. Hence much of the'discussions. that follow are centered primarily on sites with chemical hazards. The central and mostly unanswered questions are: how "clean" is clean enough; is a technology available for achieving a particular standard; what are the short and long term cost implications for'achieving that standard; and who is going to pay for remediation of the site or the development of the required technologies? Moreover, such sites are also subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as "Super-fund." The existence of CERCLA has been a significant deterrent to parties (in both the public and private sectors) who might otherwise attempt site cleanups. Their fear is that they will later be required to fund a more thorough cleanup under provisions of CERCLA. As CERCLA is currently interpreted and enforced, performing remedial actions makes the parties "site operators," who are then considered "responsible parties" liable for all past activity and future releases from the site. Because of these types of issues, to date there have been relatively few abandoned mine sites with chemical hazards that have been reclaimed.

The above issues also make it difficult to make reliable quantitative cost estimates for remediating sites with chemical hazards. Under the current regulatory regime, there are too many unknowns concerning site-specific characteristics and conditions and long term liability; these can and will affect the accuracy and magnitude of any cost estimate for a site with chemical hazards. These problems aside, some organizations have attempted estimates and projections of the costs to perform remedial actions at abandoned and inactive mine sites.

As stated, the challenges of abating physical hazards seem to be fairly straightforward and relatively inexpensive. A number of jurisdictions have done extensive work in this area. For example, it has cost the State of Montana $700 to $2,500 per closure for adits and vertical shafts.

As the following cost data show, the remediation cost estimates from different sources for remediating chemical hazards are inconsistent, some separated by orders of magnitude. Costs compiled from various sources are listed.

From Inactive and Abandoned Noncoal Mines-A Scoping Study, prepared for the Western Governors' Association Mine Waste Task Force, Western Interstate Energy Board, August 1991:

The cost of performing remedial actions is estimated to be $1,000,000 per mile for high impact polluted waters and $30,000 per acre of mine dump.

Idaho	Total remediation cost $3 15,566,900.
Montana	Total remediation cost $912,280,000; including Super-fund sites.
Nevada	Total remediation cost for hazardous mine openings $2,529,000; does not include chemical hazards.
Oregon	-Total remediation cost $57,000,000 to $77,000,0000
Utah	Total remediation cost $174,790,000.
Washington	Did not participate in survey.
Wyoming	Total remediation cost $45,000,000.

From Housman and Hoffman (22), pp. 55-62:

> The Clark Fork Basin [entirely within the ICRB] includes four distinct but contiguous Super-fund sites, covering 50,000 acres along 140 miles of the Clark Fork River and tributaries. Over the past few years, the U.S. EPA and the State of Montana have spent in excess of $33 million and the principal responsible parties have spent $20 million. Cleanup is projected to last into the next century. The Clark Fork Basin sites include Silver Bow/Butte, East Helena, Anaconda Smelter/Mill Creek, and Milltown Reservoir.
>
> There are currently 52 mining sites on the CERCLA National Priority List, the U.S. EPA's evaluation of cleanup costs to reclaim one-third of these sites exceeds $7 billion or over $411 million per site.

In 1988, the Government Accounting Office (23) estimated that 424,049 acres of federal land were unreclaimed as a result of hardrock mining in 11 western states. The portion that is abandoned is about 28 1,58 1 acres, and the estimated costs for reclamation is $1,000 per acre, or $284 million.

In 1991, the Office of the Inspector General estimated that the cost to reclaim all currently known abandoned noncoal mines is $11 billion (23).

While the above estimates are highly variable and uncertain, it is clear that remediation of sites in the ICRB will require large expenditures over the next 20 years. There are currently 8 mining sites on the CERCLA National Priorities List (NPL), not including the four identified mineral-related (uranium) sites on the Hanford Nuclear Reservation. The Environmental Protection Agency estimates a cost of $3 1 million (in 1994 dollars) to mitigate each site on the NPL, although "there is a wide variation in costs for individual sites, depending on the amount, type, and extent of the contamination"(24). For example, EPA estimates that it will cost $210 million to mitigate the Bunker Hill, Idaho site. Even though the results of the remediation cost estimates are variable and the accuracy is uncertain, a gross assumption of mining-related clean up costs can be made. While likely uncertain, the costs to clean-up mining-related sites over the next 20 years in the ICRB could be as low as $500 million or exceed $1 billion. If the Hanford CERCLA site is included, estimates could potentially double.

Known Deposits

Known deposits are a type of on-the-shelf inventory. Some are currently being mined; others could be mined at current prices, using available technology, and within existing policy conditions, but may not be experiencing sufficient demand for the product; and others could become minable with only small changes in prices or other conditions. These will be the most likely sources of mineral production in the near term. Still other deposits, although known to exist, may be too small, too low in metal content or grade, or too inaccessible to become recoverable under reasonably foreseeable conditions. Known deposits were discussed earlier, and are listed in Table 8. Their geographic locations are shown in Figure 17. Including aluminum smelting, the value of production at mining and mineral processing sites in the ICRB was approximately $2.7 billion in 1992. These operations, and those that could be developed at similar locations, are the most likely sources of globally traded minerals and metals over the next five to ten years.

Many of these operations recover sand, gravel, crushed stone, and aggregate to supply construction needs. The U.S. Geological Survey has mapped those areas within the ICRB that could be sources of these materials. These resources are extensive and shortages, in the absence of significant new constraints on mining, are unlikely. Specific sites of development will follow population concentrations and road and highway construction. If requirements for construction materials continue to approximate 11 tons per capita per year. total production could rise from 46.4 million tons in 1992 (from 449 operations) to over 100 million tons during the first half of the next century. At current average production levels, this would mean another 400-500 sand, gravel, and stone operations throughout the ICRB.

Known Mineral Deposit Areas

An axiom of many mineral exploration geologists is that new mineral deposits are most likely to be found near known mineral deposits. The general geologic conditions are obviously present and, in many cases, it is possible to extend more specific geologic controls beyond the area already fully explored. For example, if deposits have been found along a geologic fault, extensions of the same fault will likely be explored before more remote, less understood areas. Based on these considerations, the U.S. Bureau of Mines has identified areas within the ICRB as Known Mineral Deposit Areas (KMDA, see Figure 22). These areas are the next most likely locations for new mineral exploration and development, but subject to economic forces and land management decisions. In an on-going effort the USBM and the U.S. Geological Survey are combining the information developed for the KMDA and the USGS's assessment of undiscovered resources (see below).

Potential for New Deposits

Purpose and Methodology

The U.S. Geological Survey (USGS) has quantitatively assessed the potential for (as yet) undiscovered mineral resources in the ICRB. The USGS performed this assessment for two sets of boundaries. The first was strictly limited to the ICRB boundaries. The second, the "Northwest U.S.," approximately covers the area considered for landscape characterization by the ICBEMP. The assessed mineral tracts are not limited by any artificial boundary, and Figure 23 shows these tracts relative to the ICRB and State boundaries. It was this larger area whose resources were evaluated for their potential for future development.

"Undiscovered mineral resources" are defined as those resources for which only inferred information about location, quantity, and grade is available.([25])([26]) The economic potential of such resources is estimated as the proportion that could (if discovered) be produced under specified economic, technological, and land access conditions. It is based on a geologic assessment of the types, sizes, grades, and number of deposits that may remain in the region, and on estimates of the costs of mining and processing the ore. A detailed description of the methodology and its components is presented elsewhere([27]), but several characteristics should be noted here. The methodology is probabilistic, reflecting the inherent uncertainty associated with undiscovered mineral resources. This is captured in the deposit models, through distributions of grade, size, and numbers of deposits, and reflected in the results generated by the Potential Supply Analysis (PSA) Monte Carlo simulation model. The PSA integrates models of mineral deposits, engineering cost models of the mines and mills that would be used to exploit them, and estimates (multipliers) of the regional economic impacts that would result from development. A wide range of results may be presented from such analyses, but the focus here is on summary information thought most useful to the likely reader. Additional detail is contained in the appendices or available through the US. Bureau of Mines.

The USGS has assessed many areas (terranes) for the formation of mineral deposits and has prepared quantitative estimates for 25 different types of metallic deposits. The USBM, using the Potential Supply simulation model, assessed the economic potential of deposits in those terranes. Industrial minerals were not quantitatively assessed by the USGS, although maps for sand and gravel and phosphates were provided in their report.

Deposit Models and Geologic Assessment

The geological assessment is based on statistical deposit models of deposits developed by the USGS from grade and tonnage information from similar deposits both in the region and around the world, ([28]) and includes estimates of the number of deposits in the areas being assessed. The sizes of deposits used in the models depend on the deposit type, and range from very small (tens of tons of ore) to very large (in a few cases over 10 billion tons).

The estimate of the number of undiscovered deposits remaining in each terrane is for depths between the surface and 1000 meters for most deposits, and 250 meters for Hot-Spring Au-Ag deposits. The terranes cover almost the entire region. (A USGS report will provide extensive coverage of the geology and distribution of terranes.) Table A-l 1 (Appendix A-l 1) gives the estimated number of deposits at five different probability exceedance levels: 90%, 50%, 10%, 5%, and 1% exceedance. For example, there is a 50% chance that there are three or more deposits of the Epithermal Vein, Quartz Adularia type and a 1% chance of nine or more

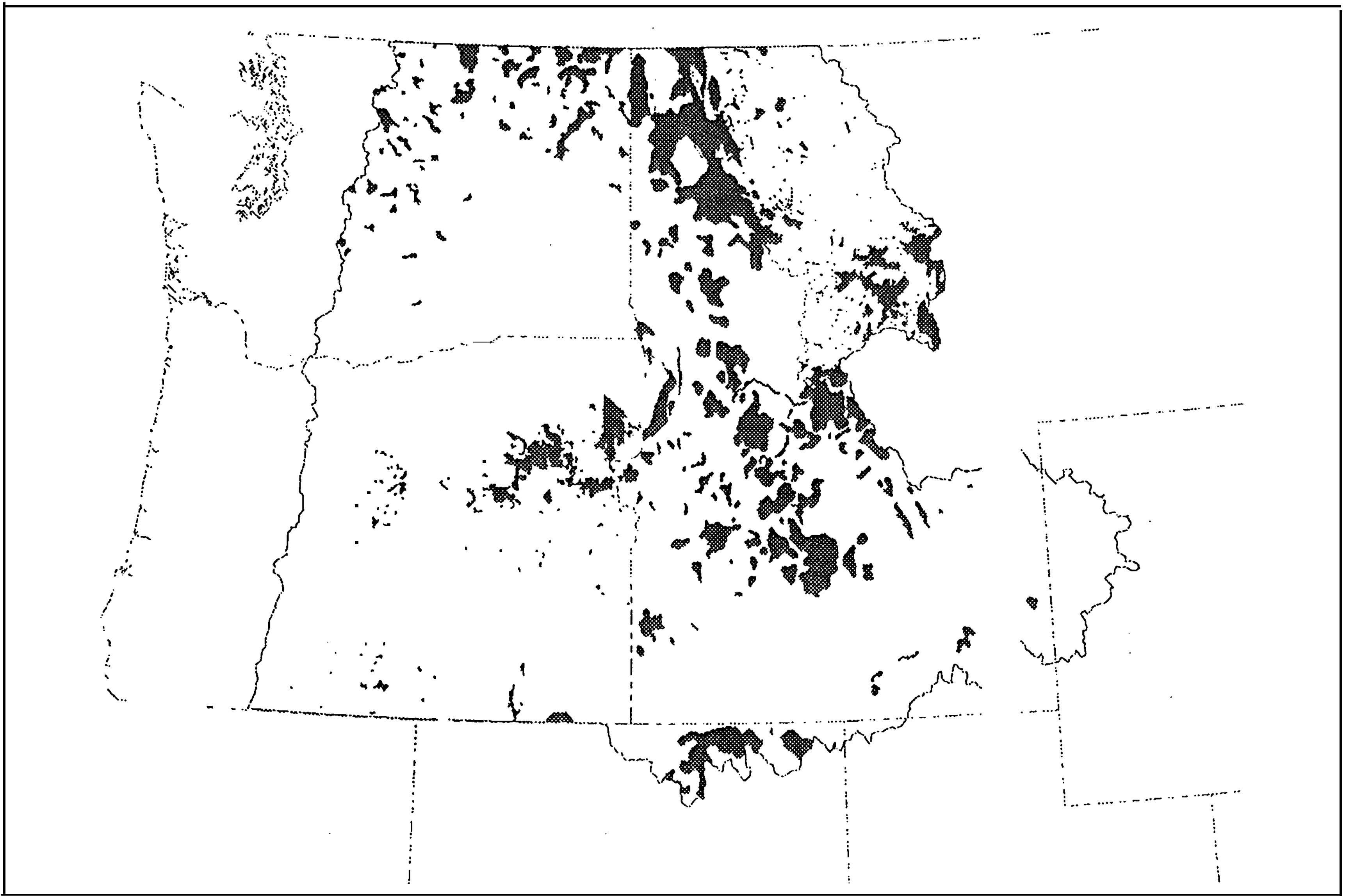

Figure 22. Known Mineral Deposit Areas

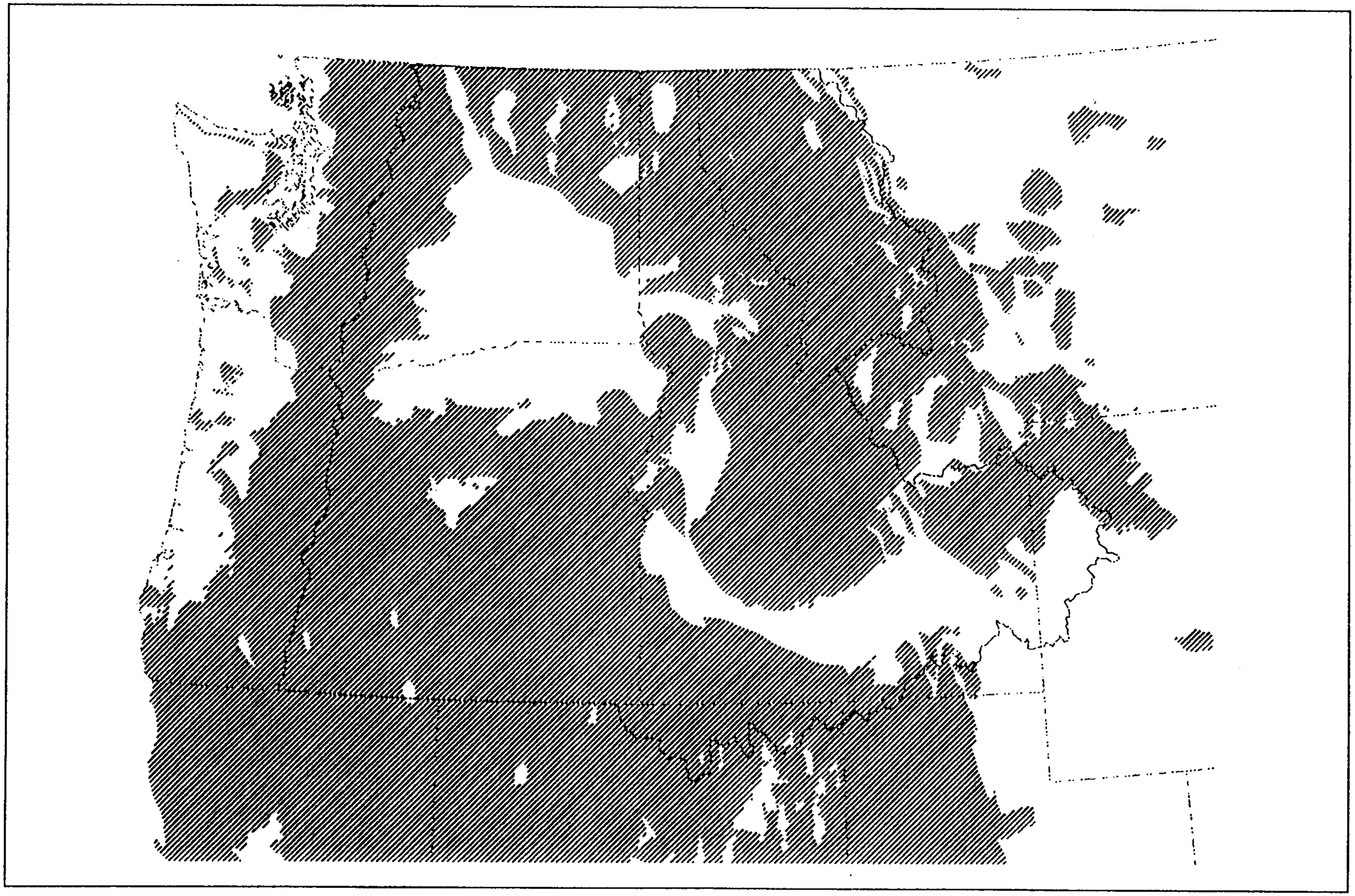

Figure 23. Permissive mineral tracts and terranes.

deposits. Note that the existence of deposits does not imply that there is sufficient grade or tonnage to justify mining and milling at current or future commodity prices and mining and milling technologies.

Mine and Mill Cost Models

The economic analysis simulated undiscovered deposits and economically evaluates them using mine and mill cost models developed by the USBM (29). These models, based on similar operations in similar environments, estimate the capital and operating costs of developing the mines and mills to exploit these deposits, and meeting all current environmental (including reclamation) requirements. The mine models estimate the proportion of the ore recovered and the mill models estimate the proportion of each metal that may be recovered, ranging from 0 to 98%.

Costs are estimated separately for the following categories: labor, equipment, steel, lumber, fuel and lube, explosives, tires, construction materials, reagents, electricity, environmental and permitting, and sales tax. A depth factor accounts for additional costs with increasing depth for underground mines, the stripping ratio for increasing costs with increasing depth for open pit mines and a dilution factor represents the quantity of waste which is mined in addition to the ore. Additional detail for the specific models may be obtained through the Western Field Operations Center, USBM. A general discussion is available in Camm (29)

Economic Assumptions

A series of assumptions regarding the economics of exploration, development, and production are made in the analysis. Each may be modified in order to examine the sensitivity of the results to changes in the assumptions or to illustrate the effects of alternative hypothetical development scenarios.

- Although some of the study area is currently withdrawn from mineral entry, it is assumed that the entire area is, or may eventually become, available for mineral exploration and development,
- All deposits have been discovered, and exploration costs are not charged against any of the deposits.
- Current rnining and milling technology is used to exploit the undiscovered deposits.
- Pre-construction time'requirement for a deposit-studies, obtaining permits, etc.-is three years, mine construction requires three years and mill construction requires two years (although concurrent with mine construction). Thus, production begins in the seventh year.
- Mine and mill capital costs are distributed equally over their construction periods.
- Costs and prices are constant throughout the mine life, and deposits are exploited at a constant rate over their lifetime. Commodity prices reflect average price levels for 1993.
- The net present value of a deposit-total revenues less total costs, discounted at 15% per annum to the present-is the criterion used to determine economic feasibility.
- There is an implicit assumption that if deposits are economically feasible, they will be developed, although a two-tiered system of exploration target priorities has been used. In reality, decisions about development will occasionally violate this assumption.

USBM and USGS members of the ICRB Ecosystem Management team have jointly developed this analysis of the economic potential of undiscovered mineral resources in the region. One result has been a clearer understanding of the interactions of models and assumptions used by the two agencies. In some cases, it was apparent that applications of the models generated estimates of recoverable resources that too conservative given recent examples of mineral deposit development. Several reasons were identified for this conservatism, representing a wide range of innovative methods to make apparently marginal deposits profitable. These include high-grading' (mining the richest portions of the deposit); recent technological improvements; reductions in processing costs; contracting for various stages of mining or processing (thus reducing the capital commitments for the company); and long term agreements to sell the product at high prices (a current example is a ten year contract to sell gold at $400 per ounce).

Several options for addressing these problems were explored, including increasingly complex models of mineral deposit development and corporate structure and decision making. However, it was felt that increased complexity was not warranted, nor would it address all potential concerns. An alternative approach was adopted in which higher prices would compensate for conservative elements in the models, and which would clearly work to increase the proportion of deposits that would be economically feasible. The prices selected for the analysis, are those currently observed, and 50% and 100% higher than current. While it seems unlikely that such prices would, in fact, be in 'force throughout the life of a mining project, it is almost certain that improvements in technologies and business strategies will continue to increase the value of mineral deposits and have a similar effect. Thus this approach will provide useful inforrnation on not only the relatively short term possibilities for mineral development, but also the types of deposits and areas that may be developed with short- or long-term improvements.

Mineral Terranes and Tracts

As previously mentioned, the USGS has quantitatively assessed the potential for 25 types of mineral deposits in the region. Each type of deposit may occur in one or more geographic areas ('tracts') within the region, and these are collectively referred to as the 'terrane' for that deposit type. Thus there are 25 terranes corresponding to the 25 deposit types. In developing the quantitative assessments, the USGS also distinguished some tracts as 'favorable,' indicating a higher likelihood of mineral deposits. The USBM, utilizing current economic criteria, separated the terranes into those considered likely exploration targets, and those with less interest. Neither categorization was quantitatively described, and neither was intended to imply a rigid distinction. However, it was felt that they would assist in anticipating the most likely areas for mineral development. Figure 24 shows the favorable tracts (as identified by the USGS) with targets and non-targets (as identified by the USBM) visually distinguished. This figure shows the areas most likely to contain deposits, with those in darker shades indicating where exploration activity is more likely to occur. Figure 25 shows those areas considered (by the USBM) as likely targets, with favorable and other tracts (from the USGS). This figure shows the most likely mineral exploration areas, with the darker shades indicating where deposits are more likely to be found. The results section will focus on the combination of favorable areas and likely targets.

Results of the Analysis

PSA simulations may be used to generate a wide variety of indicators of mineral potential in a study area, at various levels of detail. Results may be reported either probabilistically (as probability distributions), or as single numbers, usually averages or expected values. This report focuses on summary measures of mineral potential, minimizing both the number and complexity of tables and figures, while hopefully capturing principal results. Some additional detail is provided in appendix tables, and considerably more, including various sensitivity analyses, may be generated as necessary.

The simulation was performed at three levels of mineral prices: average 1993, and 50% and 100% higher. As discussed earlier, this is intended to capture not only the effects of possible higher prices, but more importantly, innovative practices on the part of mining and processing firms, possible changes in technology, and account for other conservative assumptions regarding mineral economic activities. Many of the results presented below are given for each of these price levels. Tables 10 through 13 provide results of the analysis from several different perspectives. Most of the terms and concepts used in these tables are self-explanatory, but several require some additional discussion. Tables 10 and 11 address likely exploration 'targets' (i.e., the types of deposits most eagerly sought through exploration) and tables 12 and 13 address non-targets. In tables 10 and 12, the 'Average Mine Size' refers to the average total ore quantity, in rnillions of tons, of prospective mines. Proportion Feasible' refers to the proportion of geologic deposits in the area that are likely to be of sufficient grade and size to be economically recoverable. As expected, this proportion increases with increases in prices, in some cases, quadrupling with a doubling of price. Under 'Regional Impact,' 'Jobs' and 'Output' are reported separately for construction ('Const.') and production ('Prod.') phases for an average mine during an average year.

In Tables 11 and 13, the 'Mean Number of Deposits' refers to the average number of deposits that are simulated to exist in an area, and the 'Likelihood of a Deposit' refers to the probability that there are any (one or more) there. For each price level, the 'Likelihood of Economic Activity' is the chance that one or more mines will be developed to recover minerals, and the 'Average Number of Economic Deposits' is an indicator of how many mines, on average, the: e are likely to be (given the economic assumptions). The distinction between the 'Mean Nu: n ber of Deposits' and the 'Average Number of Economic Deposits' is that the first is a measure of : -ologic endowment; the second is a measure of the economic importance of that endowment,

For targets throughout the region, the average total number of feasible deposits is about 12 Averages from individual terranes or tracts in Tables 11 and 13 cannot be added. These are res. s from the simulation model.) If developed simultaneously, these n-tines could be expected to :erate a maximum of almost 11,000 jobs, $770 million regional output, and $326 million in :e, per annum. They would, over their lives, produce 27 million troy ounces (tr.oz) of gold, ' :illion tr.oz of silver, 4 million tons of copper, 6.7 million tons of zinc, and 3.8 million tons d.

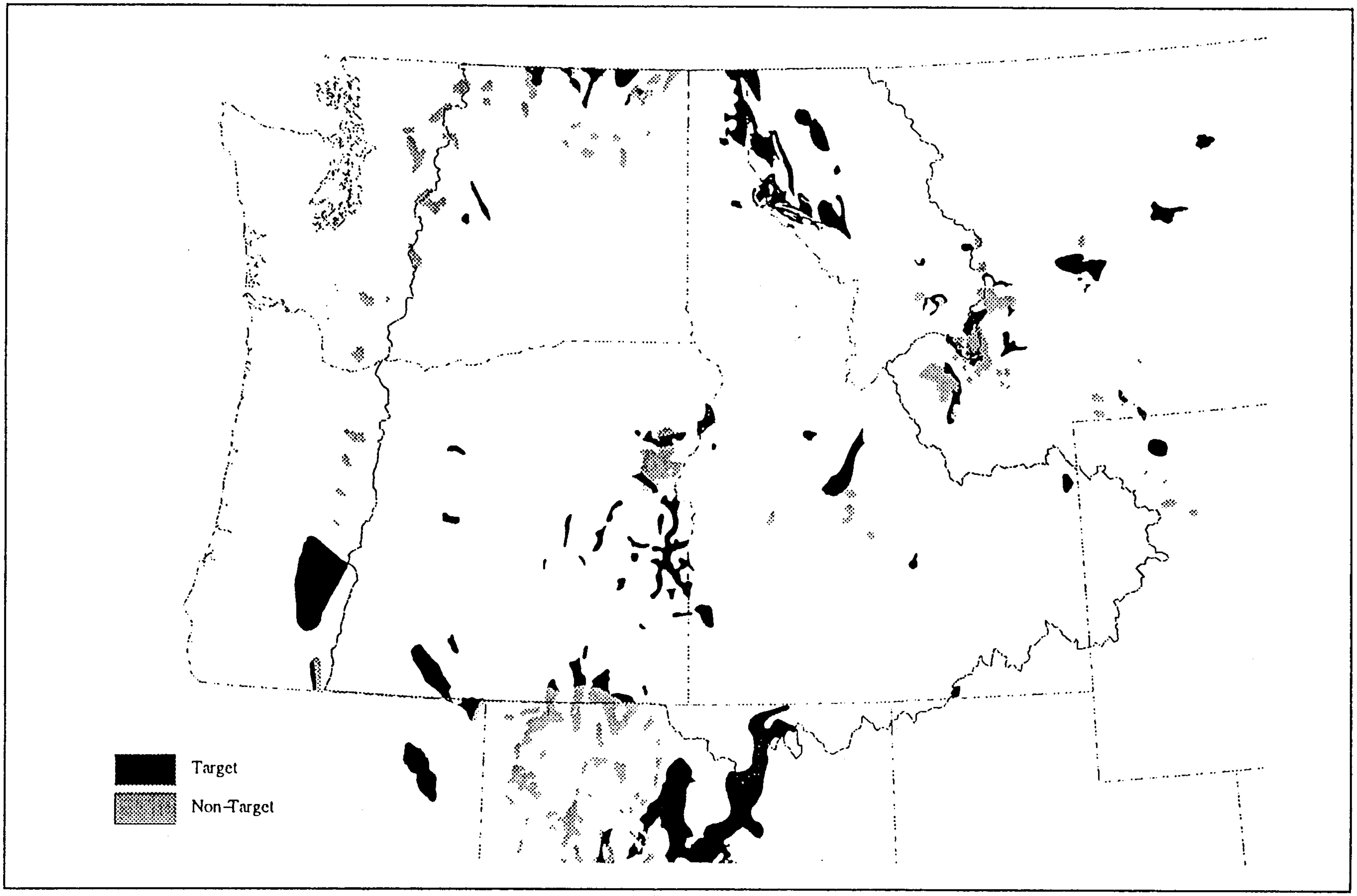

Figure 24. Favorable tracts–targets and non-targets (some tracts overlap).

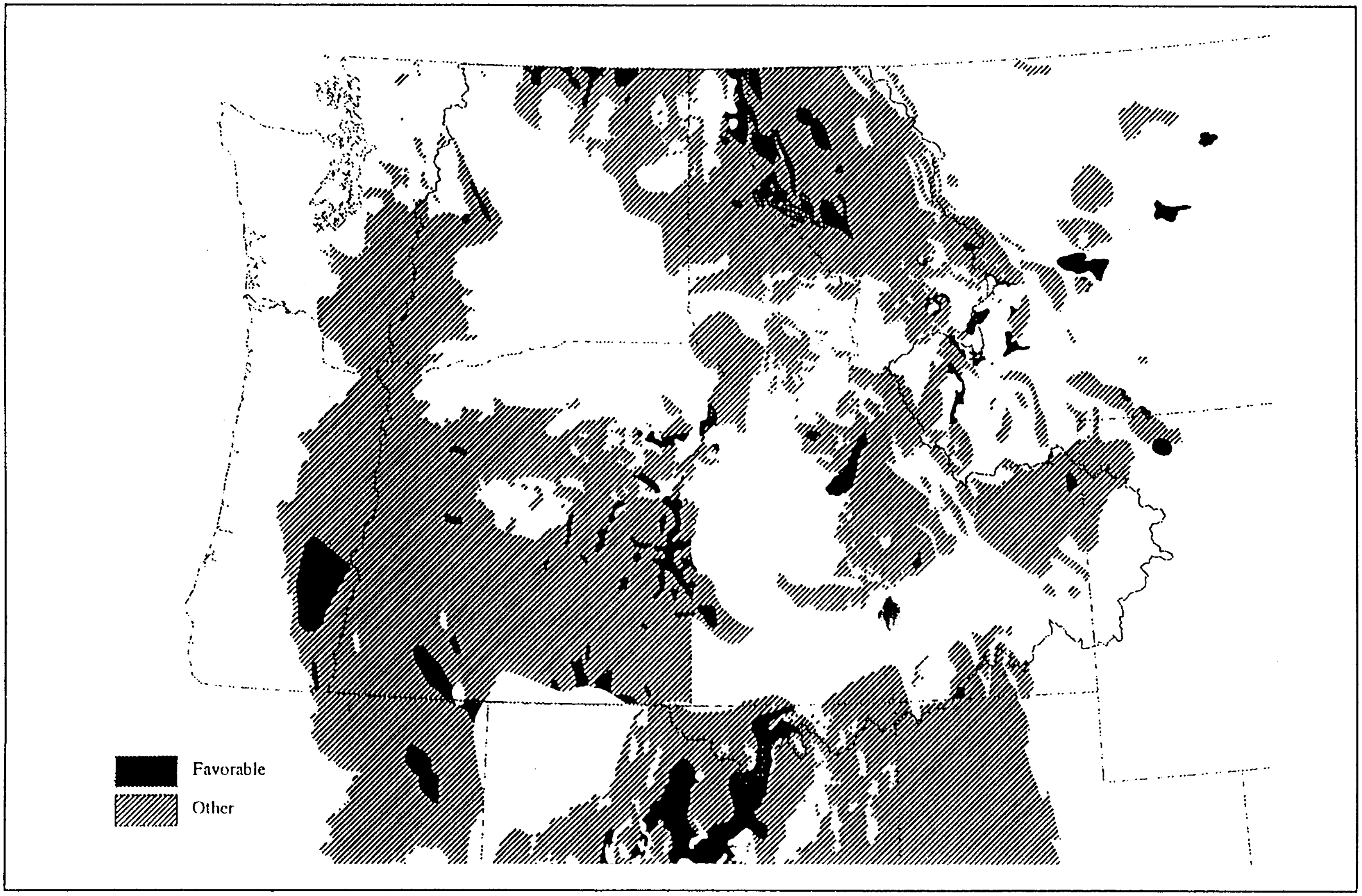

Figure 25. Exploration targets–favorable tracts and other areas (some tracts overlap).

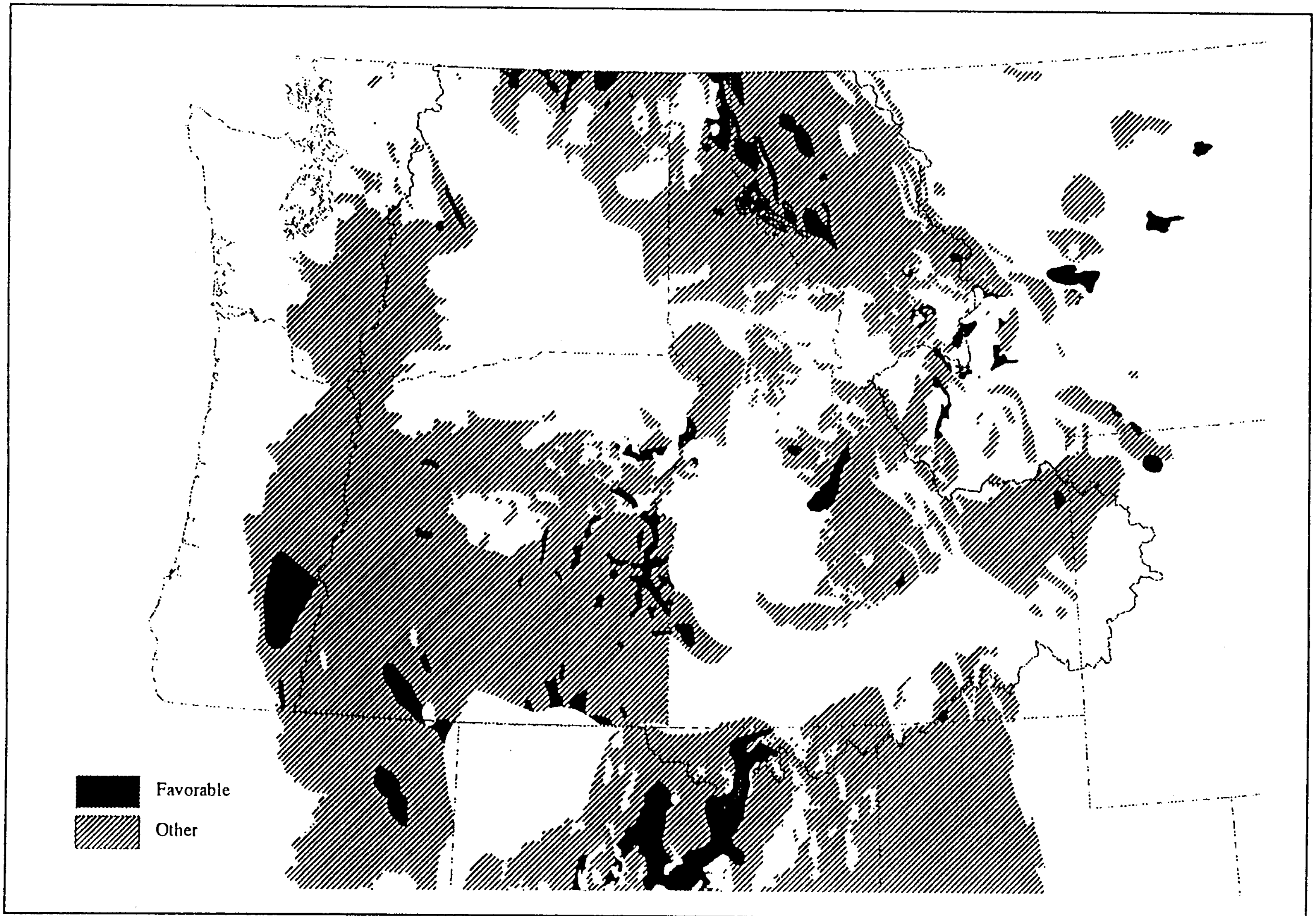

Figure 25. Exploration targets–favorable tracts and other areas (some tracts overlap).

Deposit Type	Number of Tracts	Commodity	Type of Mine (All open-pitable)	Type of Processing	Tonnage Range	Average Mine Size	Proportion Feasible Price Assumption: 1x	1.5x	2x	Regional Impact Jobs Const.	Jobs Prod.	Output ($million) Const.	Output ($million) Prod.
Alkaline Au-Te	2	Au, Ag	Cut and fill	Heap leach	80K-160M	38M	0.183	0.282	0.353	673	316	99	22
Epithermal vein, Comstock type	6	Au, Ag	Cut and fill	Carbon in leach	3K-100M	7M	0.272	0.417	0.557	372	238	52	13
Epithermal Vein, Quartz Adularia type	1	Au, Ag, Cu, Pb, Zn	Cut and fill	Carbon in leach	50K-80M	6M	0.223	0.324	0.411	155	460	68	37
Hot Spring Au-Ag	8	Au, Ag	Sublevel Longhole	Heap leach	150K-300M	33M	0.111	0.264	0.447	294	152	63	11
Massive Sulfide, Kuroko type	3	Cu, Au, Pb, Ag, Zn	Cut and fill	2 product flotation	5K-300M	25M	0.035	0.083	0.154	424	321	75	21
Sedimentary Exhaltive Zn-Pb	3	Pb,Ag,Zn	Room and Pillar	2 product flotation	200K-400M	61M	0.364	0.653	0.793	937	1145	165	99
Sediment-hosted Au	2	Au, Ag	Room and Pillar	1 product flotation	160K-500M	47M	0.102	0.232	0.353	241	250	14	19
Sediment-hosted Cu, Revett type	1	Cu, Ag, Co	Room and pillar	1 product flotation	50K-800M	137M	0.080	0.186	0.333	649	619	111	48
Sediment Hosted Cu, Reduced-Facies type	1	Cu, Ag, Co	Room and pillar	1 product flotation	500K-2B	237M	0.358	0.566	0.704	1337	730	238	60
Skarn Au	4	Au, Ag, Cu, Fe, Pb, Zn	Sublevel longhole	Carbon in leach	10-100M	3.5M	0.129	0.224	0.304	273	194	39	11

Table 10. Analytical results: terranes designated as likely exploration targets.

Tract	Terrane	Mean Number of Deposits	Likelihood of Deposit	1 x Price		1.5 x Price		2 x Price	
				Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits
C01	Alkaline Au-Te	6.24	>0.90	0.654	1.25	0.758	1.81	0.813	2.24
W100		0.44	0.10	0.055	0.06	0.067	0.08	0.084	0.10
W101	Epithermal Vein, Comstock type	2.12	≥0.90	0.621	0.87	0.791	1.30	0.870	1.54
W102		3.05	≥0.90	0.624	0.90	0.782	1.36	0.871	1.73
W02		2.39	≥0.09	0.490	0.66	0.663	1.04	0.765	1.33
PC101		2.62	0.90	0.537	0.71	0.732	1.14	0.843	1.49
PW100		1.46	0.50	0.281	0.35	0.410	0.60	0.494	0.81
C102		0.58	0.10	0.119	0.15	0.165	0.23	0.189	0.29
C13	Epithermal Vein, Quartz-Adularia type	3.09	0.90	0.494	0.67	0.661	1.04	0.757	1.35
C05	Hot Spring Au-Ag	3.09	0.90	0.229	0.26	0.519	0.73	0.712	1.21
W107		3.14	0.90	0.259	0.32	0.466	0.73	0.670	1.23
W108		12.17	0.90	0.659	1.19	0.934	3.02	0.993	4.92
W109		1.45	0.50	0.140	0.15	0.283	0.34	0.434	0.57
W112		0.71	0.10	0.067	0.07	0.148	0.17	0.224	0.29
W129		2.48	0.50	0.210	0.24	0.391	0.56	0.535	0.95
PW101		1.51	0.50	0.123	0.14	0.264	0.34	0.385	0.55
C19		1.81	0.50	0.131	0.14	0.315	0.37	0.495	0.65

Table 11. Analytical results: terranes and component tracts designated as likely exploration targets. (Continued on following page)

Tract	Terrane	Mean Number of Deposits	Likelihood of Deposits	1 x Price		1.5 x Price		2 x Price	
				Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits
W06	Sediment-hosted Au	0.03	0.01	0.006	0.01	0.008	0.01	0.012	0.01
W127		0.03	0.01	0.001	0.00	0.004	0.00	0.008	0.01
W13	Sediment-hosted Cu, Revett type	11.18	0.90	0.666	1.10	0.929	2.55	0.988	4.18
W14	Sediment-hosted Cu, Reduced Faciestype	0.51	0.10	0.151	0.19	0.206	0.28	0.236	0.33
C02	Skarn Au	12.31	0.90	0.682	1.35	0.858	2.57	0.921	3.67
W128		1.51	0.50	0.150	0.17	0.254	0.30	0.337	0.42
W137		0.03	0.01	0.004	0.00	0.010	0.01	0.016	0.02
W136		0.03	0.01	0.003	0.00	0.004	0.00	0.006	0.01
C06	Massive Sulfide, Kuroko type	0.01-0.03	0.01	0.000	0.01	0.007	0.01	0.009	0.01
W96		3.22	0.90	0.119	0.13	0.311	0.37	0.458	0.60
W113		0.03	0.01	0.000	0.00	0.001	0.00	0.002	0.00
W16	Sedimentary Exhaltive Zn-Pb	0.41	0.10	0.123	0.19	0.186	0.33	0.220	0.39
C14		2.21	0.50	0.537	0.85	0.714	1.45	0.763	1.74
W07		0.44	0.10	0.137	0.16	0.232	0.30	0.259	0.36

Table 11. Analytical results: terranes and component tracts designated as likely exploration target. (Concluded)

Deposit Type	Number of Tracts	Commodity	Type of Mine (All open-pitable)	Type Of Processing	Tonnage Range	Average Mine Size	Proportion Feasible — Price Assumption: 1x	1.5x	2x	Regional Impact — Jobs Const.	Jobs Prod.	Output ($million) Const.	Output ($million) Prod.
Massive Sulfide, Besshi type	2	Cu, Au, Ag, Zn	Cut and fill	1 product flotation	5K-40M	14M	0.018	0.04	0.066	397	308	70	20
Massive Sulfide, Cyprus type	2	Cu, Au, Ag, Pb, Zn	Sublevel longhole	1 product flotation	60K-30M	11M	0.125	0.207	0.307	334	276	59	17
Epithermal Vein, Sado type	1	Cu, Au, Ag, Zn	Sublevel longhole	Heap leach	10K-18M	4M	0.122	0.2	0.277	367	138	45	8
Epithermal Vein Quartz-Alunite type	2	Cu, Au, Ag	Sublevel Longhole	Carbon in leach	50K-21M	3.3M	0.253	0.403	0.53	108	109	25	6
Homestake Stratiform Au	1	Au, Ag	Sublevel longhole	Carbon in leach	10K-160M	15M	0.489	0.639	0.728	528	299	73	18
Massive Sulfide, Sierran Kurokotype	2	Cu, Au, Pb, Ag, Zn	Cut and fill	2 product flotation	25K-5M	1.4M	0.031	0.085	0.126	185	194	33	11
Low Sulfide Au-Quartz vein	5	Au, Ag	Sublevel longhole	Carbon in leach	5-195M	2M	0.196	0.278	0.356	289	202	41	11
Mississippi Valley, minor	1	Pb, Ag, Zn	Room and pillar	2 product flotation	500K-50M	13M	0.148	0.365	0.575	510	642	88	50
Porphyry Cu	1	Cu, Au, Mo, Ag	Block caving	1 product flotation	1M-10B	1.4B	0.024	0.106	0.212	5144	1724	873	200
Porphyry Cu, No. American	4	Cu, Ag, Ag	Block caving	1 product flotation	5M-3B	1.7B	0.014	0.062	0.163	5144	1724	873	200
Porphyry Cu, BC/AK type	4	Cu, Au, Mo, Ag	Block caving	1 product flotation	1M-1.5B	93M	0.006	0.025	0.092	802	537	137	40
Polymetallic Replacement	2	Cu, Au, Pb, Ag, Zn	Cut and fill	2 product flotation	50K-80M	13.5M	0.157	0.364	0.546	886	1622	167	131

Table 12. Analytical results: terranes not designated as likely targets. (Continued on following page)

Deposit Type	Number of Tracts	Commodity	Type of Mine (All open-pitable)	Type of Processing	Tonnage Range	Average Mine Size	Proportion Feasible			Regional Impact			
							Price Assumption:			Jobs		Output ($million)	
							1x	1.5x	2x	Const.	Prod.	Const.	Prod.
Skarn Cu	4	Cu, Au, Mo, Ag	Block caving	1 product flotation	2K-100M	14M	0.038	0.098	0.17	251	230	445	137
Porphyry Mo,Low F	7	Mo	Block caving	1 product flotation	2M-1.8B	None feasible	0	0	0.071	na	na	na	na
Skarn Zn-Pb	2	Cu, Au, Pb, Ag, Zn	Sublevel longhole	2 product flotation	25K-49M	7M	0.208	0.443	0.618	530	519	50	37

na - not applicable

Table 12. Analytical results: terranes not designated as likely targets. (Concluded)

Tract	Terrane	Mean Number of Deposits	Likelihood of Deposit	1 x Price		1.5 x Price		2 x Price	
				Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits
PC18	Massive Sulfide, Besshi type	0.03	0.01	0.000	0.00	0.000	0.00	0.000	0.00
W142		0.03	0.01	0.000	0.00	0.000	0.00	0.000	0.00
PC15a	Massive Sulfide, Cyprus type	1.03	0.5	0.127	0.13	0.228	0.25	0.300	0.34
W132		0.03	0.01	0.006	0.01	0.007	0.01	0.012	0.01
PC100	Epithermal Vein, Sado type	2.53	0.5	0.292	0.38	0.383	0.58	0.466	0.79
PC08	Epithermal Vein, Quartz Alunite type	1	0.5	0.210	0.22	0.334	0.36	0.429	0.49
C12		0.01-0.03	0.01	0.008	0.01	0.012	0.01	0.014	0.01
C04	Homestake Stratiform Au	2.11	0.5	0.631	1.05	0.733	1.42	0.759	1.60
PC15	Massive Sulfide, Sierran Kuroko type	2.38	0.5	0.049	0.05	0.140	0.16	0.220	0.27
PC16		0.38	0.1	0.008	0.01	0.026	0.03	0.044	0.04
PC20	Low-Sulfide Au-Quartz Vein	0.02	0.01	0.001	0.00	0.004	0.00	0.006	0.01
PC21		0.03	0.01	0.000	0.00	0.004	0.00	0.007	0.01
W114		0.03	0.01	0.006	0.01	0.010	0.01	0.012	0.01
W115		0.6	0.1	0.069	0.08	0.101	0.12	0.125	0.16
W135		0.84	0.5	0.115	0.14	0.176	0.23	0.210	0.29
W08	Mississippi Valley, minor	0.78	0.5	0.115	0.12	0.290	0.30	0.431	0.46

Table 13. Analytical results: terranes and component tracts not designated as likely exploration targets. (Continued on following page)

Tract	Terrane	Mean Number of Deposits	Likelihood of Deposit	1 x Price		1.5 x Price		2 x Price	
				Likelihood of Economic Deposit	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits
PC34	Porphyry Cu	0.03	0.01	0.000	0.00	0.001	0.00	0.005	0.00
C09	Porphyry Cu, N. American	3.76	0.9	0.044	0.05	0.213	0.25	0.476	0.65
W119		0.03	0.01	0.000	0.00	0.002	0.00	0.005	0.01
W119a		0.03	0.01	0.000	0.00	0.002	0.00	0.005	0.01
C100		1.5	0.5	0.027	0.03	0.102	0.11	0.228	0.27
W11	Porphyry Cu, BC/AK type	0.47	0.1	0.004	0.00	0.017	0.02	0.044	0.04
PC26		7.57	0.9	0.051	0.05	0.259	0.30	0.533	0.81
W118		0.71	0.1	0.004	0.00	0.022	0.02	0.064	0.07
PC27		4.42	0.9	0.033	0.03	0.163	0.18	0.345	0.46
C07	Polymetallic Replacement	3.69	0.9	0.468	0.69	0.769	1.54	0.889	2.30
W120		0.03	0.01	0.005	0.00	0.012	0.01	0.014	0.01
W122	Skarn Cu	0.03	0.01	0.001	0.00	0.002	0.01	0.004	0.01
W123		3.09	0.5	0.104	0.11	0.264	0.31	0.388	0.52
W124		0.03	0.01	0.001	0.00	0.002	0.01	0.004	0.01
PC05		0.03	0.01	0.001	0.00	0.002	0.01	0.004	0.01
C105	Porphyry Mo, Low F	0.03	0.01	0.000	0.00	0.000	0.00	0.001	0.00
W138		3.14	0.05	0.000	0.00	0.001	0.00	0.191	0.23
W139		0.51	0.1	0.000	0.00	0.000	0.00	0.038	0.04
W140		0.03	0.01	0.000	0.00	0.000	0.00	0.001	0.01

Table 13. Analytical results: terranes and component tracts not designated as likely exploration targets. (Continued on following page)

Tract	Terrane	Mean Number of Deposits	Likelihood of Deposit	1 x Price		1.5 x Price		2 x Price	
				Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits	Likelihood of Economic Activity	Average Number of Economic Deposits
W143	Porphyry Mo, Low F	0.03	0.01	0.000	0.00	0.000	0.00	0.001	0.01
PC102		0.03	0.01	0.000	0.00	0.000	0.00	0.009	0.01
PC103	Porphyry Mo, Low F	0.03	0.01	0.000	0.00	0.000	0.00	0.001	0.01
C15	Skarn Zn-Pb	0.81	0.1	0.151	0.18	0.259	0.37	0.310	0.51
W125		0.003	0.01	0.009	0.01	0.015	0.01	0.025	0.03

Table 13. Analytical results: terranes and component tracts not designated as likely exploration targets. (Concluded)

At 1.5 times current prices, the average number of economic deposits remaining increases to about 23. If developed simultaneously, these mines could be expected to generate a maximum of about 19,500 jobs, $1.4 billion regional output, and $592 million income, per annum. These mines would ultimately produce 36 million tr.oz of gold, 946 million tr.oz of silver, 6 million tons of copper, 8.1 million tons of zinc, and 4.6 million tons of lead.

At twice current prices, the average number of economic deposits remaining increases to about 33. If developed simultaneously, these mines could be expected to generate a maximum of about 28,300 jobs, $2.0 billion regional output, and $853 million income, per annum. These mines would ultimately produce 41 million tr.oz of gold, 1.2 billion tr.oz of silver, 7.7 million tons of copper, 8.5 million tons of zinc, and 4.8 million tons of lead. In addition, at the current (very high) price of molybdenum, about 240 thousand tons of molybdenum could be produced from a single mine.

Results by Terrane

Results can also be presented for individual terranes. The following paragraphs provide a brief overview of each mineral terrane identified by the USGS as containing undiscovered resources. They begin with likely targets, including remarks on component tracts, and end with non-targets.

- Alkaline Au-Te: This type of deposit contains potentially recoverable gold and silver and range in size from small (90 thousand tons) to 175 million tons. If discovered and the deposit is of sufficient size and grade(s), it would be exploited using either an open pit or a cut-and-fill (underground) mine and a heap leach processing mill. About one deposit in five (18%) is likely to be economically feasible to mine under the given assumptions at current prices. A typical mine would create annual employment (direct and indirect) of about 650 in the construction phase and 3 15 during mining. The regional direct and indirect output impacts would be approximately $100 million and $22 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, one with as few as zero and as many as four deposits remaining, and the other with between one and twenty deposits.[14] Tract C91 has a high likelihood (65%) of economic activity, i.e., at least one deposit is economically feasible assuming current prices.

- Epithermal Veins, Comstock type: This type of deposit contains potentially recoverable gold and silver and ranges in size from very small (a few thousand tons) to over 100 million tons. Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a carbon-in-leach processing mill. About one deposit in four (27%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about

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[14] These numbers correspond to "exceedance values." In the example above, for the second tract, this means that the USGS study indicates that there is a 90% chance that the number of undiscovered Alkaline Gold Telluride deposits will be greater than or equal to one, and only a 1% chance that the number of such deposits would exceed 20. In the following paragraphs these numbers will be reported as the range 1-20, implicitly referring to the 90% and 1% exceedance values, respectively.

370 in the construction phase and 240 during mining. The regional direct and indirect output impacts would be approximately $52 million and $13 million in the construction and operating phases, respectively.

Five tracts were identified in the study area, with from O-l to 2-8 deposits remaining. Four of these tracts (W101, W 102, W02, and PC101) have approximately a 50% or more likelihood of economic activity.

- Hot-Spring Au-Ag: This type of deposit contains potentially recoverable gold and silver and ranges in size from small (160 thousand tons) to large (over 300 million tons). Deposits would be exploited using either an open pit or a sublevel longhole (underground) mine and a heap leach processing mill. About one deposit in nine (11%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 294 in the construction phase and 152 during mining. The regional direct and indirect output impacts would be approximately $63 million and $11 million in the construction and operating phases. respectively.

  Eight tracts were identified in the study area, with from 0- 1 to 5-30 deposits remaining One tract (W108) has a high likelihood (66%) of economic activity.

- Sediment Hosted Au: This type of deposit contains potentially recoverable gold and silver and ranges in size from small (160 thousand tons) to large (500 million tons). Deposits would be exploited using either an open pit or a room and pillar (underground) mine and a one-product flotation processing mill. About one deposit in ten (10%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 241 in the construction phase and 250 during mining. The regional direct and indirect output impacts would be approximately $14 million and $19 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, each with from zero to one deposit remaining. Neither has any significant likelihood of economic activity.

- Skam Au: This type of deposit contains potentially recoverable gold and silver and ranges in size from moderate (10 million tons) to large (100 million tons). Deposit would be exploited using either an open pit or a sublevel longhole (underground) mine and a carbon-in-leach processing mill. About one deposit in eight (13%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 273 in the construction phase and 194 during mining. The regional direct and indirect output impacts would be approximately $39 million and $11 million in the construction and operating phases, respectively.

  Four tracts were identified in the study area, one with O-l and one with 3-36 deposits remaining. One tract (C02) has a high likelihood (68%) of economic activity.

- Epithermal Vein, Quartz Adularia type: This type of deposit contains potentially recoverable gold and silver and ranges in size from small (50 thousand tons) to 80 million tons. Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a carbon-in-leach processing mill. About one deposit in five (22%) is likely to be economically feasible.

A typical mine would create employment (direct and indirect) of about 155 in the construction phase and 460 during mining. The regional direct and indirect output impacts would be approximately $68 million and $37 million in the construction and operating phases, respectively.

One tract (C13) was identified in the study area, with one to nine deposits remaining. It has a 49% likelihood of economic activity.

- Sediment-Hosted Cu, Revett type: This type of deposit contains potentially recoverable copper and silver and ranges in size from small (50 thousand tons) to large (800 million tons). Deposits would be exploited using either an open pit or a room and pillar (underground) mine and a one-product flotation processing mill. About one deposit in twelve (8%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 649 in the construction phase and 619 during mining. The regional direct and indirect output impacts would be approximately $111 million and $48 million in the construction and operating phases, respectively.

  One tract (W 13) was identified in the study area, with nine to 30 deposits remaining. It has a high (67%) likelihood of economic activity.

- Sediment-Hosted Cu, Reduced Facies Type: This type of deposit contains potentially recoverable copper and silver and ranges in size from small (500 thousand tons) to very large (2 billion tons). Deposits would be exploited using either an open pit or a room and pillar (underground) mine and a one-product flotation processing mill. About one deposit in three (34%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 1337 in the construction phase and 730 during mining. The regional direct and indirect output impacts would be approximately $238 million and $60 million in the construction and operating phases, respectively.

  One tract (W14) was identified in the study area, with zero to five deposits remaining. It has a 15% likelihood of economic activity.

- Massive Sulfide, Kuroko type: This type of deposit contains potentially recoverable copper, gold, silver, zinc, and lead and ranges in size from very small (5 thousand tons) to large (300 million tons). Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a two-product flotation processing mill. About one deposit in thirty (3%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 424 in the construction phase and 321 during mining. The regional direct and indirect output impacts would be approximately $75 million and $21 million in -the construction and operating phases, respectively.

  Three tracts were identified in the study area, ranging from O-l to l-8 deposits remaining. One tract (W96) has a 12% likelihood of economic activity.

- Sedimentary Exhalative Zn-Pb: This type of deposit contains potentially recoverable zinc, lead, and silver and ranges in size from 200 thousand tons to large (400 million tons). Deposits would be exploited using either an open pit or a room and pillar (underground) mine and a two-product flotation processing mill. About one deposit in three (36%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 937 in the construction phase and 1145 during mining. The regional direct and indirect output impacts would be approximately $165 million and $99 million in the construction and operating phases, respectively.

Three tracts were identified in the study area, ranging from O-3 to O-8 deposits remaining. One tract (C14) has a high (54%) likelihood of economic activity.

The following terranes are considered lower priority exploration targets:

- Porphyry Cu, BC/AK type: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from one million tons to very large (1.5 billion tons). Deposits would be exploited using either an open pit or a block caving (underground) mine and a one-product flotation processing mill. Less than one deposit in a hundred (0.6%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 802 in the construction phase and 537 during mining. The regional direct and indirect output impacts would be approximately $137 million and $40 million in the construction and operating phases, respectively.

  Four tracts were identified in the study area, ranging from O-4 to 3-15 deposits remaining. All have low likelihoods of economic activity.

- Porphyry Cu, North American: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from five million tons to very large (3 billion tons). Deposits would be exploited using either an open pit or a block caving (underground) mine and a one-product flotation processing mill. About one deposit in a hundred (1%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 5 144 in the construction phase and 1724 during mining. The regional direct and indirect output impacts would be approximately $873 million and $200 million in the construction and operating phases, respectively.

  Four tracts were identified in the study area, ranging from 0- 1 to 1-9 deposits remaining. All have low likelihoods of economic activity.

- Porphyry Cu: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from one million tons to enormous (10 billion tons). Deposits would be exploited using either an open pit or a block caving (underground) mine and a one-product flotation processing mill. About one deposit in forty (2.4%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 5144 in the construction phase and 1724 during mining. The regional direct and indirect output impacts would be approximately $873 million and $200 million in the construction and operating phases, respectively.

  One tract was identified in the study area, with O-l deposits remaining. There is almost no likelihood of economic activity.

- Porphyry MO, Low F: This type of deposit contains potentially recoverable molybdenum and ranges in size from two million tons to very large (1.8 billion tons). Deposits would be exploited using either an open pit or a block caving (underground) mine and a one-product flotation processing mill. Less than one deposit in a thousand is likely to be economically feasible.

Seven tracts were identified in the study area, with 0- 1 to 0- 10 deposits remaining. All have low likelihoods of economic activity.

- Massive Sulfide, Sierran Kuroko type: This type of deposit contains potentially recoverable copper, gold, silver, zinc, and lead and ranges in size from small (25 thousand tons) to moderate (5 million tons). Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a two-product flotation processing mill. About one deposit in thirty (3%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 185 in the construction phase and 194 during mining. The regional direct and indirect output impacts would be approximately $33 million and $11 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, ranging from O-2 to O-12 deposits remaining. Both have low likelihoods of economic activity.

- Massive Sulfide, Cypus type: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from small (30 thousand tons) to 30 million tons. Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a two-product flotation processing mill. About one deposit in eight (12.5%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 334 in the construction phase and 276 during mining. The regional direct and indirect output impacts would be approximately $59 million and $17 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, ranging from O-2 to O-12 deposits remaining. One tract (PC15a) has a 13% likelihood of economic activity.

- Massive Sulfide, Besshi type: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from small (50 thousand tons) to 21 million tons. Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a one-product flotation processing mill. About one deposit in fifty (2%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 397 in the construction phase and 308 during mining. The regional direct and indirect output impacts would be approximately $70 million and $20 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, each with O-l deposits remaining. Both have low likelihoods of economic activity.

- Mississippi Valley, minor: This type of deposit contains potentially recoverable lead, zinc, and silver and ranges in size from 500 thousand tons to 50 million tons. Deposits would be exploited using either an open pit or a room and pillar (underground) mine and a two-product flotation processing mill. About one deposit in seven (15%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 5 10 in the construction phase and 642 during mining. The regional direct and indirect output impacts would be approximately $88 million and $50 million in the construction and operating phases, respectively.

One tract (WOS) was identified in the study area, with O-2 deposits remaining. It has a 12% likelihood of economic activity.

- Skarn Zn-Pb: This type of deposit contains potentially recoverable copper, gold, silver, zinc, and'lead, and ranges in size from small (25 thousand tons) to 49 million tons. Deposits would be exploited using either an open pit or a sublevel longhole (underground) mine and a two-product flotation processing mill. About one deposit in five (21%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 530 in the construction phase and 5 19 during mining. The regional direct and indirect output impacts would be approximately $50 million and $37 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, ranging from 0- 1 to O-6 deposits remaining. One tract (C15) has a 15% likelihood of economic activity.

- Polymetallic Replacement: This type of deposit contains potentially recoverable copper, gold, silver, zinc, and lead and ranges in size from small (50 thousand tons) to 80 million tons. Deposits would be exploited using either an open pit or a cut-and-fill (underground) mine and a two-product flotation processing mill. About one deposit in six (16%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 886 in the construction phase and 1622 during mining. The regional direct and indirect output impacts would be approximately $167 million and $131 million in the construction and operating phases, respectively.

  Two tracts were identified in the study area, ranging from O-l to l-12 deposits remaining. One tract (C07) has a 47% likelihood of economic activity.

- Skarn Cu: This type of deposit contains potentially recoverable copper, gold, and silver and ranges in size from very small (2 thousand tons) to large (100 million tons). Deposit would be exploited using either an open pit or a block caving (underground) mine and a one-product flotation processing mill. About one deposit in a twenty-five (4%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 251 in the construction phase and 230 during mining. The regional direct and indirect output impacts would be approximately $445 million and $137 million in the construction and operating phases, respectively.

  Four tracts were identified in the study area, ranging from 0- 1 to 0- 12 deposits remaining. One tract (W123) has a 10% likelihood of economic activity.

- Epithermal Vein, Quartz Alunite type: This type of deposit contains potentially recoverable gold and silver and ranges in size from small (30 thousand tons) to 21 million tons. Deposits would be exploited using either an open pit or a sublevel longhole (underground) mine and a carbon-in-leach processing mill. About one deposit in a four (25%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about

108 in the construction phase and 109 during mining. The regional direct and indirect output impacts would be approximately $25 million and $6 million in the construction and operating phases, respectively.

Two tracts were identified in the study area, ranging from O-l to O-2 deposits remaining. One tract (PC08) has a 21% likelihood of economic activity.

- Epithermal Vein, Sado type: This type of deposit contains potentially recoverable gold and silver and ranges in size from small (10 thousand tons) to 30 million tons. Deposits would be exploited using either an open pit or a sublevel longhole (underground) mine and a heap leach processing mill. About one deposit in a eight (12%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 367 in the construction phase and 138 during mining. The regional direct and indirect output impacts would be approximately $45 million and $8 million in the construction and operating phases, respectively.

  One tract (PC100) was identified in the study area, with from O-8 deposits remaining. It has a 29% likelihood of economic activity.

- Low Sulfide Au-Quartz Vein: This type of deposit contains potentially recoverable gold and silver and ranges in size from very small (5 thousand tons) to 195 million tons. Deposits would be exploited using either an open pit or a sublevel longhole (underground) mine and a carbon-in-leach processing mill. About one deposit in a five (20%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 289 in the construction phase and 202 during mining. The regional direct and indirect output impacts would be approximately $41 million and $11 million in the construction and operating phases, respectively.

  Five tracts were identified in the study area, ranging from O-l to O-7 deposits remaining. One tract (W135) has a 12% likelihood of economic activity.

- Homestalce Stratiform Au: This type of deposit contains potentially recoverable gold and silver and ranges in size from very small (10 thousand tons) to 160 million tons. Deposits of sufficient size and grade(s), it would be exploited using either an open pit or a sublevel longhole (underground) mine and a carbon-in-leach processing mill. About one deposit in a two (49%) is likely to be economically feasible. A typical mine would create employment (direct and indirect) of about 528 in the construction phase and 299 during mining. The regional direct and indirect output impacts would be approximately $73 million and $18 million in the construction and operating phases, respectively.

  One tract (C04) was identified in the study area, with O-6 deposits remaining. It has a high (63%) likelihood of economic activity.

Conclusions

The information provided in this section is not a forecast of mineral economic activity. Rather, it is an indication of the potential for future development in the region given current geologic knowledge, economic conditions, and mining and processing technologies. The information, gathered and analyzed by the USGS and the USBM, can be visually summarized in at least four ways: all geographic areas thought to have potential for undiscovered mineral deposits; a more specific geological perspective, emphasizing areas most favorable for the existence of undiscovered deposits; an exploration perspective, concentrating on those types of deposits that are currently targets; and a composite view that combines the geologic and exploration perspectives along with some results from economic analyses.

The first of these visual summaries was presented in Figure 23, which illustrates that a large proportion of the region is considered permissive-that is, has the potential for one or more types of undiscovered deposits. Many types of deposits are represented in this figure, including some for which there is little information, and some which are of little current commercial interest. Figure 24 focuses on those portions of the permissive area considered by geologists to be most likely to contain undiscovered deposits. These sub-areas, termed 'favorable tracts,' cover a much smaller portion of the region, and tend to be concentrated in a relatively few areas. For favorable tracts, targets and non-targets are shown in different shades.

In Figure 25, the emphasis is on exploration, showing all targets and highlighting (darker shade) those in favorable tracts. The areas that may contain exploration targets cover large areas, indicating that exploration activity may occur throughout the region. However, discoveries are considered more likely in the relatively small portions (favorable) indicated by the darker shading.

Figure 26 summarizesthe geologic and exploration perspectives, adding an economic interpretation as well. The areas shaded are those that are both exploration targets and within favorable areas (the overlap of Figures 24 and 25). The varying shades indicate the likelihood that, given deposits are found, mining and mineral processing will occur (from Table 11). The darkest shades indicate a likelihood greater than 60% that mineral economic activity will occur in the absence of land use constraints, and the lightest shades indicate the lowest likelihood (less than 1 chance in 5). As can be seen, the areas with the greatest potential for mineral economic activity are concentrated in three portions of the ICRB: from Southeastern Oregon north into Central Oregon; along the Northern Idaho/Northwestern Montana border; and along the ICRB border in northwest of the Yellowstone National Park. Areas with lower, but still important possibilities include Central Idaho; an area along Washington's border with Canada, and several areas along the eastern slopes of the Cascades.

It should be noted that exploration, discovery, and mining may occur throughout the region, and that changes in technology, economic, and land access may alter the results presented here. However, the geologic, exploration, and economic information summarized in Figure 26 indicates that much of the potential for new mineral development will tend to be concentrated within a relatively small portion of the Interior Columbia River Basin.

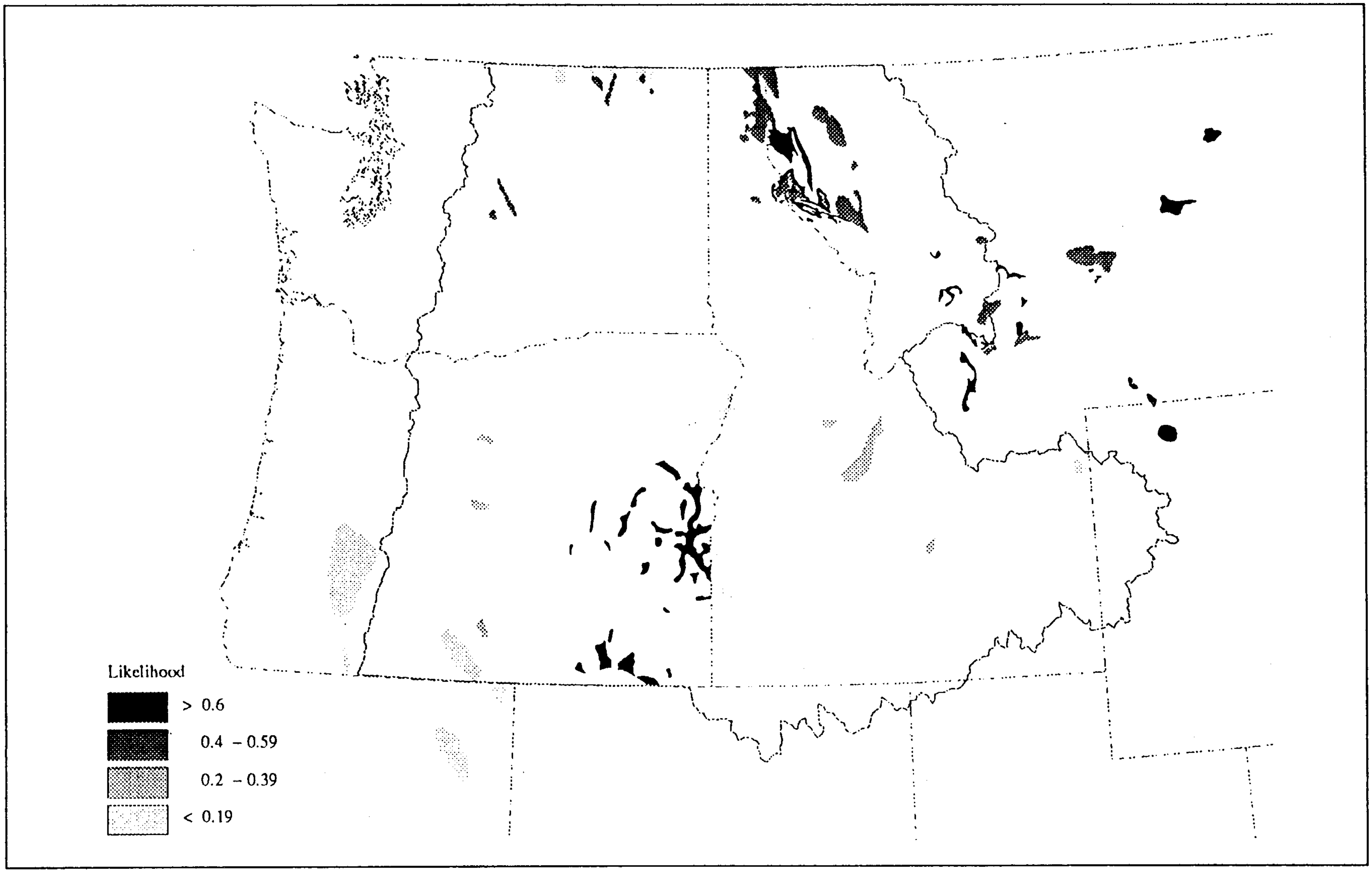

Figure 26. Likelihood of economic activity, at current prices, in areas designated as favorable for mineral deposits, considered to be current exploration targets, and for which quantitative assessments exist.

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Appendix A-l. Value of mineral production ($m), 19051992.

State	Mineral Production ($m) by Year				
			1905	1906	1907
ID			16,769	22,721	21,301
MT			65,501	74,127	60,664
OR			2,442	2,640	2,639
WA			8,791	9,936	11,618
U.S.			1,623,765	1,900,880	2,069,570
	1908	1909	1910	1911	1912
ID	15,256	14,909	15,437	19,442	21,816
MT	46,804	57,493	54,388	53,498	71,621
OR	2,744	2,814	3,740	3,193	2,554
WA	11,610	15,484	16,693	15,865	15,347
U.S.	1,591,773	1,887,107	1,987,844	1,924,081	2,237,794
	1913	1914	1915	1916	1917
ID	24,566	24,913	33,612	49,249	55,224
MT	69,307	54,245	89,147	142,650	123,650
OR	3,564	3,331	3,657	4,499	4,074
WA	17,580	13,831	11,456	14,521	18,576
U.S.	2,433,545	2,111,172	2,394,644	3,508,439	4,992,496
	1918	1919	1920	1921	1922
ID	36,872	19,045	32,450	16,502	18,496
MT	139,332	73,631	85,885	30,162	59,401
OR	4,192	3,963	5,496	5,200	5,490
WA	21,000	18,268	26,677	17,606	19,725
U.S.	5,540,708	4,623,770	6,981,340	4,138,500	4,647,290
	1923	1924	1925	1926	1927
ID	27,105	27,832	31,611	31,753	29,184
MT	74,707	70,632	79,261	79,766	68,265
OR	6,054	7,364	7,827	6,941	6,821

Appendix A-l. Value of mineral production ($m), 1905-1992 (continued).

State	Mineral Production ($m) by Year				
WA	22,169	21,159	22,382	21,256	21,965
U.S.	5,986,500	5,305,800	5,677,630	6,213,600	5,530,000
	1928	1929	1930	1931	1932
ID	28,589	32,143	22,904	13,177	9,478
MT	74,752	93,842	50,995	32,359	19,023
OR	6,687	6,877	6,170	5,045	2,989
WA	22,120	22,435	20,076	14,800	12,817
U.S.	5,385,200	5,887,600	4,764,800	3,166,600	2,461,700
	1933	1934	1935	1936	1937
ID	12,429	16,708	21,364	29,966	49,633
MT	21,662	31,430	52,097	65,569	82,087
OR	3,205	4,211	5,596	7,081	6,610
WA	9,388	12,945	13,688	22,921	26,658
U.S.	2,555,100	3,325,400	3,650,000	4,556,800	5,413,400
	1938	1939	1940	1941	1942
ID	31,739	33,138	40,800	45,674	54,290
MT	48,603	63,344	79,488	86,583	96,682
OR	7,536	8,637	11,230	12,830	14,066
WA	21,167	31,596	28,090	28,507	35,660
U.S.	4,363,200	4,914,200	5,613,900	6,878,000	7,576,300
	1943	1944	1945	1946	1947
ID	57,475	51,321	44,348	44,444	66,941
MT	91,633	89,052	75,978	62,114	88,231
OR	12,310	9,657	9,463	11,807	16,573
WA	37,547	36,483	31,301	33,029	39,924
U.S.	8,071,800	8,417,000	8,141,000	8,896,000	12,393,000
	1948	1949	1950	1951	1952
ID	79,128	64,292	79,324	83,171	77,848

Appendix A-l. Value of mineral production ($m), 1905-1992 (continued).

State	Mineral Production ($m) by Year				
MT	103,841	98,070	103,625	126,376	122,069
OR	23,923	21,845	21,542	28,402	26,674
WA	48,928	40,863	49,055	54,554	56,139
U.S.	12,273,000	10,580,000	11,862,000	13,529,000	13,392,000
	1953	1954	1955	1956	1957
ID	67,063	69,689	68,513	75,150	73,502
MT	132,184	126,412	166,993	213,704	191,750
OR	24,449	32,268	31,736	34,021	42,820
WA	54,577	53,300	64,334	61,723	60,471
U.S.	14,418,000	14,066,000	15,804,000	17,365,000	18,113,000
	1958	1959	1960	1961	1962
ID	64,648	70,392	57,606	69,034	82,614
MT	176,728	168,099	179,406	184,233	190,656
OR	45,190	50,849	55,772	53,092	52,458
WA	60,896	65,830	68,448	72,404	68,474
U.S.	16,528,000	17,381,000	18,032,000	18,230,000	18,838,000
	1963	1964	1965	1966	1967
ID	82,787	86,262	105,085	114,885	109,408
MT	182,018	211,452	228,163	245,268	186,524
OR	62,692	64,363	82,966	107,484	66,560
WA	71,430	81,310	87,664	89,096	82,067
U.S.	19,615,000	20,507,000	21,524,000	22,968,000	32,734,000
	1968	1969	1970	1971	1972
ID	114,253	118,309	119,759	112,280	106,206
MT	228,131	282,631	313,016	285,073	307,676
OR	64,449	60,164	68,081	78,035	76,516
WA	81,425	88,626	90,922	94,601	109,806
U.S.	24,966,000	26,921,000	29,791,000	30,712,000	32,185,000

Appendix A-l. **Value** of mineral production ($m), 19051992 (continued).

State	Mineral Production ($m) by Year				
	1973	1974	1975	1976	1977*
ID	136,081	208,558	233,788	210,246	252,670
MT	385,285	574,801	573,150	636,289	213,253
OR	81,577	103,920	106,004	112,566	109,132
WA	114,663	143,930	158,505	187,222	152,887
U.S.	36,787,000	55,077,000	62,266,000	69,186,000	16,930,000
	1978	1979	1980	1981**	1982
ID	299,231	437,882	522,095	424,877	300,078
MT	205,800	291,287	279,550	303,081	270,753
OR	128,843	165,321	151,970	139,547	107,844
WA	180,435	225,150	207,362	208,508	172,082
U.S.	19,823,000	23,974,000	25,146,000	25,288,000	19,675,000
	1983	1984	1985	1986	1987
ID	415,159	412,351	358,666	274,048	269,373
MT	291,968	240,001	200,282	237,933	368,178
OR	110,940	120,402	130,296	126,432	160,996
WA	187,465	202,677	221,607	376,625	438,434
U.S.	21,120,000	23,161,000	23,307,000	23,464,000	26,342,000
	1988	1989	1990	1991	1992
ID	290,616	364,610	375,318	297,533	306,061
MT	544,521	566,137	573,294	534,283	539,154
OR	178,188	187,728	204,595	197,928	214,170
WA	459,334	480,879	473,059	482,661	469,039
U.S.	32,225,000	32,220,000	33,434,000	31,038,000	32,012,000

* prior to 1977 values include mineral fuels.
** beginning in 1981, sand and gravel portion of value is estimated in odd years; stone in even years.

Source: U.S. Bureau of Mines

Appendix A-2. Gross state product ($m).

State	Gross State Product ($m) by Year						
Idaho	1977	1982	1986	1987	1988	1989	1990
Total	7,363	10,875	13,714	14,600	15,630	17,542	18,555
Farms	604	1,020	886	1,000	1,095	1,488	1,617
Ag Services	48	72	112	154	154	167	195
Mining	97	174	154	142	180	193	201
Construction	519	528	633	602	624	674	873
Manufacturing	1,219	1,541	2,121	2,413	2,681	3,138	2,955
Durables	739	749	1,131	1,327	1,543	1,838	1,677
Nondurables	479	793	991	1,086	1,138	1,299	1,278
Trans & Pub Util	623	1,067	1,323	1,323	1,406	1,472	1,518
Wholesale	463	666	759	779	831	919	988
Retail	747	993	1,404	1,463	1,556	1,712	1,816
FIRE	1,323	2,045	2,677	2,899	2,963	3,318	3,454
Services	847	1,433	1,977	2,089	2,257	2,451	2,729
Fed Civilian Gov't	189	279	335	344	398	434	463
Fed Military Gov't	109	167	215	224	225	222	216
St and Local Gov't	573	890	1,119	1,170	1,260	1,354	1,529
Montana	1977	1982	1986	1987	1988	1989	1990
Total	6,477	10,608	11,487	11,842	11,969	13,200	13,331
Farms	396	801	630	656	395	854	737
Ag Services	29	36	57	84	75	77	88
Mining	458	1,403	794	759	848	845	862
Construction	476	609	505	431	432	454	484
Manufacturing	712	746	960	1,032	1,059	1,190	1,121
Durables	455	352	553	649	616	724	653
Nondurables	258	394	407	383	443	466	468
Trans & Pub Util	764	1,223	1,553	1,608	1,701	1,721	1,729
Wholesale	413	612	648	642	662	714	736

Appendix A-2. Gross state product ($m) (continued).

State	Gross State Product ($m) by Year					
Retail	643	900	1,119	1,119	1,174	1,268	1,291
FIRE	946	1,696	1,924	1,990	2,004	2,176	2,164
Services	748	1,238	1,672	1,780	1,903	2,053	2,227
Fed Civilian Gov't	234	342	393	499	421,421	528	487
Fed Military Gov't	101	131	152	146	157	170	181
St and Local Gov't	556	871	1,081	1,095	1,139	1,151	1,224
Oregon	1977	1982	1986	1987	1988	1989	1990
Total	21,971	30,810	41,681	44,870	48,479	52,364	55,426
Farms	622	941	1,109	1,217	1,459	1,562	1,598
Ag Services	139	227	408	508	488	526	611
Mining	63	65	61	61	60	64	81
Construction	1,196	1,034	1,472	1,531	1,715	1,981	2,296
Manufacturing	5,561	6,273	8,887	9,881	10,490	11,368	10,823
Durables	4,240	4,485	6,641	7,173	7,601	8,330	7,816
Nondurables	1,321	1,788	2,247	2,708	2,889	3,038	3,007
Trans & Pub Util	2,178	3,259	4,087	4,366	4,612	4,786	5,182
Wholesale	1,631	2,387	3,128	3,194	3,507	3,911	4,114
Retail	2,152	2,971	4,032	4,177	4,510	4,920	5,227
FIRE	3,197	5,145	6,865	7,388	7,882	8,204	8,941
Services	2,649	4,466	6,507	7,146	7,847	8,721	9,695
Fed Civilian Gov't	523	800	1,061	1,174	1,324	1,437	1,606
Fed Military Gov't	81	124	173	180	184	180	195
St and Local Gov't	1,979	3,119	3,890	4,047	4,401	4,704	5,057
Washington	1,977	1,982	1,986	1,987	1,988	1,989	1,990
Total	35,003	58,696	78,688	84,766	91,241	99,882	109,362
Farms	970	1,474	1,636	1,786	1,881	2,218	2,249
Ag Services	335	436	1,028	1,048	1,130	1,130	1,313
Mining	54	146	183	201	244	303	306

Appendix A-2. Gross state product ($m) (continued).

State	Gross State Product ($m) by Year						
Construction	2,369	3,184	3,630	3,849	4,291	4,767	5,364
Manufacturing	7,170	11,002	14,254	15,664	16,952	18,948	20,902
Durables	5,042	7,725	9,719	10,521	11,161	12,664	14,628
Nondurables	2,128	3,278	4,535	5,143	5,791	6,284	6,274
Trans & Pub Util	2,883	4,896	6,673	6,943	7,511	8,000	8,540
Wholesale	2,806	4,544	5,795	6,133	6,588	7,221	7,800
Retail	3,802	6,121	8,320	8,747	9,386	10,440	11.240
FIRE	4,813	9,227	13.210	14,438	15.475	16,599	18,088
Services	4.449	8,569	12,139	13.323	14,289	15,883	18.059
Fed Civilian Gov't	1,253	1,914	2,458	2,671	2,902	3,100	3,449
Fed Military Gov't	814	1.413	1.736	1.850	2,022	1.963	2.143
St and Local Gov't	3.284	5,769	7.626	8.115	8,572	9.311	9,908
U.S.	1977	1982	1986	1987	1988	1989	1990
Total	1,957,608	3.104,181	4.186.032	4,483.510	4,854,260	5.164,671	5.546.100
Farms	50,427	76,975	75,775	78.813	80.682	88,587	85,100
Ag Services	8.469	12,621	17,823	21.857	23,575	24,896	26,900
Mining	50,152	132.122	74,289	76,836	80,017	80,254	103,100
Construction	97,895	140,908	203,803	219.165	237,395	247,721	240,100
Manufacturing	465,346	634,648	832,420	875,539	940,656	965,997	1,024,700
Durables	277,673	362,512	478,079	499,874	527,137	540,995	563,700
Nondurables	187,673	272,136	354,341	375,665	413,519	425,002	461,000
Trans & Pub Util	178,852	288,441	394,898	413.903	444.270	460,863	481,200
Wholesale	139,804	219,004	282,047	294,774	317,377	339,468	363,000
Retail	192,951	287,480	400.537	426,355	459,947	485,979	515,700
FIRE	280,349	475,139	696,262	761,606	826,756	896,652	982,400
Services	253,431	463,633	717,624	793,590	885.203	970,539	1,040,000
Fed Civilian Gov't	54,469	80,108	100,163	105.213	112,696	125,481	221,300
Fed Military Gov't	27,807	46,668	57,997	60,387	62,524	65,111	

Appendix A-2. Gross state product ($m) (continued).

State	Gross State Product ($m) by Year						
St and Local Gov't	157,656	246,434	332,394	355,472	383,162	413,123	454,900

Source: Survey of Current Business

Appendix A-3. Mining Employment (1) Interior Columbia River Basin, 1969-92.

State	Mining Employment by Year						
	1969	1970	1971	1972	1973	1974	1975
Idaho	3,938	3,943	3,904	3,530	3,508	3,996	4,094
Montana	7,066	7,288	6,121	6,939	7,523	8,138	7,295
Oregon	1,875	1,791	2,060	1,982	2,276	2,267	2,119
Washington	2,055	2,233	2,547	2,455	2,483	2,483	2,358
	1976	1977	1978	1979	1980	1981	1982
Idaho	3,743	3,818	4,281	4,805	5,324	6,011	4,655
Montana	6,964	7,263	8,284	8,763	9,767	12,659	10,872
Oregon	1,893	2,253	2,687	2,976	3,121	3,234	3,075
Washington	2,591	3,007	3,551	4,043	4,423	4,773	4,908
	1983	1984	1985	1986	1987	1988	1989
Idaho	4,877	4,998	4,593	3,619	3,235	3,877	4,255
Montana	9,050	9,486	8,608	7,613	7,589	7,768	7,729
Oregon	2,997	3,099	3,036	2,937	2,867	2,541	2,428
Washington	4,782	4,845	4,968	5,140	5,190	5,274	5,494
	1990	1991	1992				
Idaho	4,455	3,645	3,174				
Montana	7,630	7,224	7,040				
Oregon	2,581	2,635	2,658				
Washington	5,507	5,420	5,113				

(1) includes mineral fuels.

Source: Bureau of Economic Analysis, Regional Economic Information System, 1994.

Appendix A-4. Mining Earnings ($m) (1) Interior Columbia River Basin States, 1969-92.

State	Mining Earnings ($m) by Year						
	1969	1970	1971	1972	1973	1974	1975
Idaho	32280	37097	37792	39347	41659	56121	66039
Montana	57708	63330	56954	69763	83599	108363	116920
Oregon	15499	15256	15944	20222	24753	35048	40570
Washington	19894	21345	21124	26754	31032	44477	55511
	1976	1977	1978	1979	1980	1981	1982
Idaho	67023	77407	93969	107195	144871	181793	140778
Montana	111773	126671	156572	192588	247479	342514	303026
Oregon	47798	57270	61393	72270	101468	116809	95393
Washington	73557	86909	88253	108378	164619	181057	165781
	1983	1984	1985	1986	1987	1988	1989
Idaho	159388	168871	160112	117229	105082	128271	192917
Montana	256638	259657	245875	219187	219623	244843	255571
Oregon	78367	83975	96115	79656	80859	62604	69823
Washington	127934	138194	153475	125056	136060	150143	160853
	1990	1991	1992				
Idaho	206530	190022	183004				
Montana	251314	268054	263180				
Oregon	71151	83597	92427				
Washington	169335	182503	182152				

(1) includes mineral fuels.

Source: Bureau of Economic Analysis, Regional Economic Information System, 1994.

Appendix A-5. Value of Mineral Production by groups of Interior CRB counties, 1984-92 (thousands of 1987 dollars).

County Group	Totals	Year			
		1,984	1,985	1,986	1,987
Eastern Cascades	Totals for Others	w	w	w	w
	Totals for Sand&Gravel and Stone (1)	W	7,785	w	13,554
	Total	10,533	W	57,152	w
Northern Rockies and Okanogan Highlands	Totals for Others	w	w	w	w
	Totals for Sand&Gravel and Stone (1)	W	W	W	23,229
	Total	305,941	237,064	168,662	w
Blue Mountains and Idaho Batholith	Totals for Others	86,506	w	82,054	156,939
	Totals for Sand&Gravel and Stone (1)	15,633	w	20,852	23,639
	Total	102,139	91,358	109,596	180,578
Yellowstone Highlands	Totals for Others	w	w	43,464	35,183
	Totals for Sand&Gravel and Stone (1)	W	W	5,621	7,434
	Total	108,795	125,943	49,085	42,617
Intermountain Semi-desert	Totals for Others	198,531	186,045	262,016	349,437
	Totals for Sand&Gravel and Stone (1)	26,569	24,423	23,095	28,954
	Total	225,099	210,468	285,111	378,391
		1988	1989	1990	1991
Eastern Cascades	Totals for Others	w	w	w	w
	Totals for Sand&Gravel and Stone (1)	w	w	w	w
	Total	78,361	72,261	69,410	68,869
Northern Rockies and Okanogan Highlands	Totals for Others	W	322,975	240,102	166,718
	Totals for Sand&Gravel and Stone (1)	27,174	28,532	29,784	27,500

Appendix A-5. Value of Mineral Production by groups of Interior CRB counties, 1984-92 (thousands of 1987 dollars) (continued).

County Group	Totals	Year			
	Total	w	351,507	269,886	194,218
Blue Mountains and Idaho Batholith	Totals for Others	w	191,478	221,080	w
	Totals for Sand&Gravel and Stone (1)	w	16,413	17,504	w
	Total	230,957	207,891	238,584	240,572
Yellowstone Highlands	Totals for Others	67,718	49,902	84,135	67,990
	Totals for Sand&Gravel and Stone (1)	10,094	7,266	8,540	10,226
	Total	77,812	57,168	92,675	78,216
Intermountain Semi-desert	Totals for Others	504,751	499,665	518,477	522,110
	Totals for Sand&Gravel and Stone (1)	38,251	28,552	30,572	35,048
	Total	543,002	528,217	549,049	557,158
		1992			
Eastern Cascades	Totals for Others	w			
	Totals for Sand&Gravel and Stone (1)	w			
	Total	65,466			
Northern Rockies and Okanogan Highlands	Totals for Others	w			
	Totals for Sand&Gravel and Stone (1)	w			
	Total	161,188			
Blue Mountains and Idaho Batholith	Totals for Others	w			
	Totals for Sand&Gravel and Stone (1)	w			
	Total	194,237			
Yellowstone Highlands	Totals for Others	95,523			
	Totals for Sand&Gravel and Stone (1)	12,813			

Appendix A-5. Value of Mineral Production by groups of Interior CRB counties, 1984-92 (thousands of 1987 dollars) (continued).

County Group	Totals	Year			
	Total	72,336			
Intermountain Semi-desert	Totals for Others	545,383			
	Totals for Sand&Gravel and Stone (1)	45,163			
	Total	590,546			

(1) Sand&Gravel estimated in odd years, Stone estimated in even years.
figures may not sum due to independent rounding.
W Withheld to avoid disclosure of confidential information.

Eastern Cascades - Oregon: Deschutes, Hood River, Jefferson, Klamath, Wasco. Washinton: Chelan, Kittitas, Klickitat, Okanogan, Skamania, Yakima.

Northern Rockies and Okanogan - Idaho: Benewah. Bonner. Boundry. Clearwater, Kootenai. Latah, Lewis. Nez Perce, Shoshone. Montana: Flathead, Lake, Lincoln, Mineral, Missoula. Sanders. Washington: Ferry, Pend Orielle, Spokane, Stevens.

Blue Mountains and Idaho Batholith - Idaho: Adams, Blaine, Boise, Butte. Camas, Clark, Custer, Elmore, Gem, Idaho. Lemhi, Valley, Washington. Montana: Deer Lodge, Granite, Lewis and Clark, Powell, Ravalli. Silver Bow. Washington: Asotin. Columbia. Garfield.

Yellowstone Highlands - Idaho: Bannock, Bonneville. Caribou. Fremont. Teton. Wyoming: Fremont, Lincoln, Sublette, Teton.

Intermountain Semi-desert - Idaho: Ada, Bingham, Canyon, Cassia, Gooding, Jefferson, Jerome, Lincoln, Madison, Minidoka, Onieda, Owyhee, Payette, Power, Twin Falls. Nevada: Elko, Humboldt. Oregon: Crook, Gilliam, Harney, Lake, Malheur, Morrow, Sherman, Wheeler. Utah: Box Elder. Washington: Adams, Benton, Douglas, Franklin, Grant, Lincoln, Walla Walla, Whitman.

Source: US Bureau of Mines

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92.

State/County	Mining Employment by Year						
	1969	1970	1971	1972	1973	1974	1975
Idaho							
Ada	622	805	655	792	1098	1586	2093
Adams	(L)	107	237	423	685	879	868
Bannock	113	117	96	187	247	420	558
Benewah	(L)	(L)	(L)	79	90	194	163
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	911	269	168	135	(L)	400	225
Boise	76	(L)	(L)	(L)	(L)	(L)	55
Bonner	(L)	(L)	53	95	116	182	234
Bonneville	316	562	355	372	568	744	1128
Boundary	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Butte	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Camas	0	(L)	0	0	0	(L)	(L)
Canyon	199	279	284	389	471	570	758
Caribou	2494	5238	5549	8175	8110	10419	14575
Cassia	(L)	(L)	(L)	75	100	145	177
Clark	(L)	128	120	167	230	311	398
Clearwater	(L)	(L)	(L)	(L)	(L)	59	(L)
Custer	540	623	645	379	553	1120	1283
Elmore	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fremont (incl. YNP)	(L)	(L)	(L)	(L)	(L)	(L)	59
Gem	98	71	54	76	89	127	174
Gooding	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Idaho	129	102	159	159	146	354	269
Jefferson	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Jerome	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Kootenai	127	(L)	53	85	143	268	323

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Latah	485	581	441	295	246	585	381
Lemhi	175	140	372	136	81	244	240
Lewis	(L)	(L)	0	(L)	(L)	(L)	(L)
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Madison	(L)	(L)	(L)	(L)	(L)	(L)	63
Minidoka	(L)	(L)	(L)	(L)	(L)	51	253
Nez Perce	(L)	(L)	(L)	(L)	(L)	177	171
Oneida	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Owyhee	81	(L)	(L)	(L)	169	110	277
Payette	(L)	(L)	(L)	(L)	(L)	99	(L)
Power	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Shoshone	23366	25552	25996	24465	24847	32201	36397
Teton	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Twin Falls	-66	(L)	193	122	(L)	535	365
Valley	101	74	(L)	55	72	104	156
Washington	(L)	(L)	(L)	86	110	135	175
Montana							
Deer Lodge	1968	3468	1904	787	1055	2721	1718
Flathead	308	396	319	294	497	871	1183
Granite	238	185	131	70	(L)	418	561
Lake	(L)	(L)	(L)	(L)	85	209	274
Lewis and Clark	231	106	142	126	141	976	970
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Mineral	186	230	153	112	61	53	68
Missoula	98	124	129	302	438	1140	1458
Powell	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Ravalli	123	98	128	63	112	243	284
Sanders	(L)	95	136	138	128	261	341

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Silver Bow	27117	34474	30453	41190	45724	51429	48845
Nevada							
Elko	1157	795	1085	1066	1407	3106	3304
Oregon							
Baker	500	310	353	418	428	418	494
Crook	51	58	120	(L)	(L)	(L)	101
Deschutes	343	288	246	385	570	844	953
Gilliam	0	0	0	0	0	0	0
Grant	52	88	82	(L)	(L)	(L)	(L)
Harney	(L)	(L)	(L)	(L)	(L)	83	134
Hood River	(L)	(L)	(L)	(L)	(L)	88	137
Jackson	443	397	362	452	542	2271	2958
Jefferson	63	77	56	76	(L)	(L)	64
Klamath	(L)	(L)	(L)	513	688	1032	1128
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	(L)	(L)	(L)	(L)	(L)	79	162
Morrow	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Sherman	0	0	(L)	(L)	(L)	(L)	(L)
Umatilla	59	66	131	280	411	904	1062
Union	(L)	(L)	182	356	279	228	195
Wallowa	(L)	(L)	(L)	(L)	75	54	(L)
Wasco	(L)	(L)	(L)	(L)	(L)	86	282
Wheeler	0	0	0	0	0	0	0
Utah							
Box Elder	(L)	(L)	(L)	(L)	(L)	206	126
Washington							
Adams	(L)	(L)	(L)	(L)	(L)	(L)	52
Asotin	(L)	(L)	(L)	(L)	(L)	(L)	53

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Benton	371	271	421	830	148	244	251
Chelan	92	237	110	197	242	395	665
Columbia	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Douglas	(L)	284	368	255	203	169	218
Ferry	836	841	834	860	984	1167	1254
Franklin	77	58	59	111	150	137	219
Garfield	0	0	0	0	0	0	0
Grant	227	236	251	438	482	634	730
Kittitas	62	(L)	(L)	(L)	(L)	123	210
Klickitat	(L)	95	180	137	83	117	240
Lincoln	(L)	(L)	(L)	(L)	(L)	67	106
Okanogan	192	197	146	238	168	221	344
Pend Oreille	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Skamania	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Spokane	1853	2164	2268	2308	2605	3765	4417
Stevens	1430	1823	1188	1210	1204	1510	1900
Walla Walla	(L)	(L)	(L)	(L)	64	166	254
Whitman	339	203	167	357	362	1231	921
Yakima	564	635	596	462	646	923	1366
Wyoming							
Fremont	16078	16875	18556	21690	21636	27493	31660
Lincoln	2284	2579	2903	3568	4728	7767	9187
Sublette	983	1311	1357	1345	2322	3630	5040
Teton	267	186	376	214	1472	4322	6010
	1976	1977	1978	1979	1980	1981	1982
Idaho							
Ada	2741	2906	2489	2716	5715	5457	4928
Adams	958	720	684	738	1278	1351	(D)

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Bannock	633	558	454	560	857	724	653
Benewah	223	290	288	338	567	653	(D)
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	232	495	403	549	1242	1933	1673
Boise	56	54	79	156	486	206	162
Bonner	288	232	141	185	481	581	404
Bonneville	1322	1383	1676	1384	1638	2402	2501
Boundary	(L)	(L)	(L)	(L)	62	63	60
Butte	(L)	(L)	(L)	(L)	65	(L)	(L)
Camas	(L)	0	0	0	0	(L)	(L)
Canyon	1033	1046	1488	1855	2306	2019	2122
Caribou	15646	15848	21939	21031	28311	29977	19352
Cassia	306	354	388	353	673	638	511
Clark	387	103	83	140	293	542	107
Clearwater	(L)	91	84	100	213	264	249
Custer	1082	1108	1182	1403	2355	7031	16294
Elmore	(D)	(D)	(D)	(D)	(D)	(D)	(L)
Fremont (incl. YNP)	81	69	(L)	53	122	124	107
Gem	215	226	219	189	85	86	61
Gooding	63	73	(L)	110	190	164	150
Idaho	328	497	579	578	1022	1177	578
Jefferson	67	68	(L)	54	115	125	218
Jerome	(L)	(L)	(L)	55	127	124	99
Kootenai	366	473	382	515	1173	1279	1109
Latah	355	315	258	682	975	1153	883
Lemhi	132	303	309	1797	5049	4372	1915
Lewis	(L)	(L)	(L)	(L)	(L)	69	237
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	1339

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Baker	520	708	696	1673	2375	5017	(D)
Crook	150	172	108	83	550	511	(D)
Deschutes	1231	1618	1815	3353	2983	2097	1684
Gilliam	0	0	0	0	0	(L)	(L)
Grant	206	340	331	463	1004	984	667
Harney	161	(L)	(L)	(L)	53	(L)	(L)
Hood River	176	181	130	179	357	315	200
Jackson	3543	2776	2488	2516	4470	5906	4714
Jefferson	68	64	(L)	55	122	94	334
Klamath	444	524	434	879	1523	1391	1324
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	174	206	161	237	428	339	468
Morrow	(L)	(L)	(L)	(L)	57	65	(L)
Sherman	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Umatilla *	992	713	626	759	1091	1965	1303
Union	303	256	174	561	243	404	472
Wallowa	(L)	67	53	71	115	110	89
Wasco	379	345	342	431	585	640	580
Wheeler	0	0	0	0	0	(L)	(L)
Utah							
Box Elder	199	276	237	244	366	530	328
Washington							
Adams	73	70	(L)	56	148	159	117
Asotin	76	76	52	68	159	162	117
Benton	440	882	1352	1546	1923	1695	1500
Chelan	838	917	1002	1136	1447	1723	(D)
Columbia	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Douglas	224	335	508	1258	1025	242	196

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Ferry	1419	1718	1423	1816	4427	6506	(D)
Franklin	504	650	582	637	803	642	559
Garfield	0	0	0	0	0	(L)	(D)
Grant	834	999	1676	4328	3562	3292	3342
Kittitas	270	496	602	871	1284	1317	1243
Klickitat	163	174	290	265	286	382	218
Lincoln	145	141	82	101	259	275	210
Okanogan	476	1334	3618	345	556	786	651
Pend Oreille	(D)	(D)	(D)	(D)	(D)	(D)	298
Skamania	(D)	(D)	(D)	(D)	(D)	(D)	227
Spokane	6030	7495	7162	8602	13737	16576	13743
Stevens	2702	3083	4386	10391	12441	12691	10626
Walla Walla	478	601	317	349	821	1015	634
Whitman	598	634	351	387	824	752	460
Yakima	2004	2200	1959	2604	3580	3861	3299
Wyoming							
Fremont	40449	61180	84100	105122	114017	101181	82013
Lincoln	15879	20081	24615	31340	36891	43033	36686
Sublette	2427	2807	3846	5125	7908	10907	10962
Teton	1039	2485	3024	4891	6769	7479	9143
	1983	1984	1985	1986	1987	1988	1989
Idaho							
Ada	3642	4888	5580	3216	1706	2787	16071
Adams	(D)	(D)	(D)	(D)	(L)	67	412
Bannock	510	581	639	286	232	232	1157
Benewah	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	2465	1652	1807	(D)	1858	1183	1402

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Boise	305	336	388	281	290	340	148
Bonner	658	734	810	630	1022	643	3826
Bonneville	2171	1881	1985	843	330	1040	104
Boundary	(L)	82	96	(D)	105	50	820
Butte	(L)	(D)	(D)	(D)	126	78	(D)
Camas	(L)	(L)	(L)	(L)	109	(D)	(D)
Canyon	2678	2904	3147	1745	873	1069	2158
Caribou	26442	30676	24720	16109	19986	17858	17736
Cassia	212	263	283	197	159	(L)	1546
Clark	513	603	670	(D)	(D)	(D)	(D)
Clearwater	343	481	798	869	1046	(L)	3294
Custer	20431	20481	16994	(D)	(D)	(D)	(D)
Elmore	(L)	171	353	571	(D)	589	491
Fremont (incl. YNP)	86	141	147	(D)	105	(L)	868
Gem	78	290	384	345	(D)	414	382
Gooding	75	91	84	(L)	(L)	(L)	(L)
Idaho	2603	2559	2872	2564	(D)	2636	3831
Jefferson	320	296	358	657	429	192	1604
Jerome	(L)	(L)	56	(L)	0	(L)	0
Kootenai	1091	1263	1501	4792	5127	5548	7264
Latah	987	1231	1345	(D)	1416	439	9257
Lemhi	1370	1006	594	(D)	331	591	1933
Lewis	(L)	(L)	(L)	(L)	0	(L)	(L)
Lincoln	99	(L)	(L)	(D)	50	(L)	666
Madison	(L)	(L)	(L)	(L)	0	(L)	0
Minidoka	(L)	(L)	55	(L)	(L)	(L)	0
Nez Perce	723	528	477	137	69	996	1488
Oneida	(D)	(D)	(D)	(D)	(D)	(D)	(D)

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Owyhee	7377	7320	7056	6182	(D)	(D)	(D)
Payette	68	72	95	(L)	0	121	(L)
Power	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Shoshone	72196	76355	75503	46704	37017	54835	63624
Teton	(L)	(L)	(L)	(L)	0	0	0
Twin Falls	2270	1498	1323	921	668	1528	5729
Valley	793	944	837	(D)	2225	2764	4977
Washington	328	434	288	(D)	289	89	1358
Montana							
Deer Lodge	387	526	338	(D)	371	504	540
Flathead	2717	2386	2436	1888	1567	1872	1909
Granite	(D)	(D)	2179	1661	2012	1784	1019
Lake	240	579	486	242	212	756	1126
Lewis and Clark	5576	3233	2559	2073	3192	5600	5298
Lincoln	(D)	(D)	(D)	(D)	14922	13534	14348
Mineral	(L)	(L)	(L)	50	(L)	(L)	0
Missoula	4000	4702	3959	3157	1743	3136	2666
Powell	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Ravalli	914	728	674	608	585	191	835
Sanders	802	485	520	581	611	888	366
Silver Bow	25958	8935	9859	13772	14576	23825	(D)
Nevada							
Elko	23676	27909	31295	33260	43877	46244	56344
Oregon							
Baker	(D)	(D)	(D)	2264	(D)	1348	1422
Crook	(D)	(D)	(D)	(D)	538	247	584
Deschutes	1650	2091	2212	1573	1819	907	1678
Gilliam	(L)	(L)	(L)	(L)	(D)	(D)	(D)

Appendix A-6. Mining employment (1) by Interibr CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Grant	537	475	498	440	482	219	294
Harney	58	(L)	126	(L)	(D)	(D)	0
Hood River	57	101	126	(L)	(L)	85	(L)
Jackson	4834	4227	4332	3325	3838	3933	3779
Jefferson	197	212	235	150	349	280	(L)
Klamath	1001	1283	1278	416	548	632	232
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	768	1442	2098	2540	3253	1589	1443
Morrow	(L)	(L)	(L)	(L)	0	0	0
Sherman	(L)	(L)	(L)	(L)	0	0	(D)
Umatilla	1541	1375	1904	2345	2422	1427	1136
Union	785	499	574	390	424	156	1406
Wallowa	(L)	196	226	680	475	85	200
Wasco	321	744	856	702	764	433	387
Wheeler	(L)	(L)	(L)	(L)	0	0	0
Utah							
Box Elder	190	303	270	(D)	163	(D)	281
Washington							
Adams	(L)	96	96	(L)	(L)	78	51
Asotin	(L)	101	148	89	110	94	85
Benton	990	962	768	84	257	225	82
Chelan	(D)	1426	4103	7903	9359	(D)	(D)
Columbia	(L)	(L)	(L)	(L)	0	0	0
Douglas	93	139	169	130	113	94	85
Ferry	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Franklin	227	306	265	595	250	253	(D)
Garfield	(D)	(D)	(D)	(L)	0	(D)	(D)
Grant	3583	(D)	3496	3525	(D)	(D)	(D)

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Kittitas	117	1235	1030	509	604	189	79
Klickitat	389	(D)	(D)	(D)	351	271	197
Lincoln	62	106	122	(L)	0	(L)	(D)
Okanogan	609	1560	2068	1919	2165	706	739
Pend Oreille	208	202	166	197	112	(L)	123
Skamania	209	(D)	(D)	216	247	519	575
Spokane	9855	12355	13465	12368	14809	18387	19313
Stevens	7426	5796	4347	3882	4051	4017	3955
Walla Walla	593	348	536	169	344	534	716
Whitman	232	281	381	105	247	126	86
Yakima	1903	3094	3024	1625	1980	1913	1350
Wyoming							
Fremont	63813	43508	34651	20141	18593	18008	13133
Lincoln	34455	32225	31255	24300	23127	25252	24683
Sublette	8149	10415	11394	14117	11085	11554	14229
Teton	5790	5222	9580	-5031	382	767	505
	1990	1991	1992				
Idaho							
Ada	17448	11100	10339				
Adams	143	(L)	(D)				
Bannock	1504	1536	1632				
Benewah	(D)	(D)	(D)				
Bingham	(D)	(D)	5119				
Blaine	1351	1453	1697				
Boise	589	762	706				
Bonner	4870	5070	5544				
Bonneville	134	141	151				
Boundary	1102	1083	1204				

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Butte	(D)	(D)	(D)				
Camas	(D)	(D)	0				
Canyon	3185	3289	3410				
Caribou	20250	22908	25160				
Cassia	2722	3724	4734				
Clark	(D)	(D)	(D)				
Clearwater	2061	3470	3616				
Custer	(D)	(D)	15029				
Elmore	375	0	0				
Fremont (incl. YNP)	1143	1147	1233				
Gem	427	(D)	(D)				
Gooding	(L)	(L)	(D)				
Idaho	3987	(D)	4388				
Jefferson	2150	2243	2441				
Jerome	0	0	0				
Kootenai	7752	8814	8423				
Latah	10178	10264	11555				
Lemhi	2776	2741	2541				
Lewis	(L)	0	(D)				
Lincoln	903	906	966				
Madison	0	0	(D)				
Minidoka	0	0	(D)				
Nez Perce	1713	(D)	(D)				
Oneida	(D)	(D)	(D)				
Owyhee	(D)	(D)	8234				
Payette	80	309	751				
Power	(D)	(D)	(D)				
Shoshone	63451	46598	38955				

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Teton	0	0	0				
Twin Falls	6288	7282	7919				
Valley	7343	5726	3726				
Washington	1974	1980	2107				
Montana							
Deer Lodge	587	572	2752				
Flathead	1847	(D)	2993				
Granite	696	411	1032				
Lake	650	996	1047				
Lewis and Clark	3977	4041	4037				
Lincoln	15593	13868	13590				
Mineral	0	(L)	(D)				
Missoula	1153	1450	1709				
Powell	(D)	(D)	6770				
Ravalli	652	937	767				
Sanders	398	346	322				
Silver Bow	(D)	(D)	23442				
Nevada							
Elko	59564	70626	76322				
Oregon							
Baker	1716	1803	2031				
Crook	564	(D)	801				
Deschutes	1443	1630	1746				
Gilliam	0	0	0				
Grant	403	216	221				
Harney	0	0	0				
Hood River	(L)	(L)	(D)				
Jackson	2827	3346	3597				

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year					
Jefferson	57	127	(D)			
Klamath	125	228	427			
Lake	(D)	(D)	890			
Malheur	1613	1932	1826			
Morrow	0	0	0			
Sherman	(D)	0	(D)			
Umatilla	850	1078	1123			
Union	843	1328	1418			
Wallowa	266	255	263			
Wasco	368	(D)	671			
Wheeler	0	0	0			
Utah						
Box Elder	345	222	(D)			
Washington						
Adams	60	(D)	(D)			
Asotin	(L)	78	173			
Benton	100	185	(D)			
Chelan	(D)	11642	12496			
Columbia	(L)	56	(D)			
Douglas	51	72	70			
Ferry	(D)	17420	16001			
Franklin	(D)	291	366			
Garfield	0	0	0			
Grant	(D)	(D)	(D)			
Kittitas	(L)	71	67			
Klickitat	232	291	419			
Lincoln	0	0	0			
Okanogan	657	1172	1794			

Appendix A-6. Mining employment (1) by Interior CRB county, 1969-92 (continued).

State/County	Mining Employment by Year						
Pend Oreille	153	171	339				
Skamania	266	(D)	(D)				
Spokane	16827	17294	18895				
Stevens	4507	6496	5097				
Walla Walla	479	724	696				
Whitman	(L)	67	71				
Yakima	983	1143	467				
Wyoming							
Fremont	18386	21408	18660				
Lincoln	27716	28079	28239				
Sublette	10410	11586	10289				
Teton	1134	7553	13290				

(1) includes mineral fuels.
(L) less than $50000
(D) withheld to avoid disclosure of confidential information.

ource: Bureau of Economic Analysis. Regional Economic Information System. 1994.

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92.

State/County	Mining Earnings ($m) by Year						
	1969	1970	1971	1972	1973	1974	1975
Idaho							
Ada	86	111	158	116	135	112	91
Adams	(L)	(L)	27	44	58	67	48
Bannock	20	45	18	27	56	50	49
Benewah	13	(L)	15	16	16	19	14
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	144	56	49	17	16	21	33
Boise	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Bonner	(L)	11	16	12	14	17	17
Bonneville	50	79	60	50	42	46	53
Boundary	0	0	0	0	0	(L)	0
Butte	18	(L)	(L)	(L)	(L)	(L)	(L)
Camas	0	(L)	0	0	0	0	0
Canyon	29	35	28	28	57	58	61
Caribou	246	222	221	265	217	246	325
Cassia	(L)	12	(L)	31	18	34	47
Clark	(L)	(L)	(L)	(L)	13	13	(L)
Clearwater	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Custer	94	91	87	49	85	91	119
Elmore	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fremont (incl. YNP)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Gem	21	15	(L)	(L)	11	16	18
Gooding	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Idaho	24	21	22	31	17	18	21
Jefferson	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Jerome	15	11	(L)	(L)	(L)	(L)	(L)
Kootenai	21	(L)	(L)	28	36	22	15

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Latah	65	71	74	59	30	58	30
Lemhi	39	38	83	55	45	41	38
Lewis	(L)	0	0	0	0	0	0
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Madison	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Minidoka	10	(L)	12	23	10	16	28
Nez Perce	(L)	(L)	19	14	(L)	(L)	11
Oneida	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Owyhee	14	(L)	(L)	21	42	16	22
Payette	(L)	11	(L)	(L)	(L)	11	(L)
Power	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Shoshone	2,656	2,754	2,649	2,291	2,200	2,583	2,618
Teton	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Twin Falls	17	21	36	(L)	10	27	33
Valley	20	14	(L)	(L)	(L)	(L)	(L)
Washington	(L)	(L)	(L)	(L)	15	11	11
Montana							
Deer Lodge	253	465	243	84	131	283	132
Flathead	28	40	25	31	28	22	19
Granite	76	65	39	67	69	71	72
Lake	(L)	(L)	22	(L)	(L)	(L)	(L)
Lewis and Clark	60	30	34	43	22	49	59
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Mineral	21	27	16	14	(L)	(L)	(L)
Missoula	13	12	13	36	55	49	44
Powell	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Ravalli	35	13	38	12	32	24	17
Sanders	12	19	28	22	40	37	32

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Silver Bow	2,817	3,371	2,581	3,427	3,557	3,562	2,795
Nevada							
Elko	140	97	110	121	117	198	184
Oregon							
Baker	67	55	43	59	58	48	53
Crook	18	(L)	17	(L)	17	(L)	10
Deschutes	35	37	56	60	73	78	60
Gilliam	0	0	0	0	0	0	0
Grant	(L)	(L)	12	(L)	(L)	(L)	(L)
Harney	10	(L)	(L)	(L)	(L)	(L)	(L)
Hood River	12	22	(L)	(L)	(L)	(L)	(L)
Jackson	59	66	82	37	63	153	180
Jefferson	27	16	14	12	10	(L)	(L)
Klamath	33	(L)	21	55	65	69	60
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	(L)	18	(L)	(L)	(L)	(L)	(L)
Morrow	0	0	0	0	0	0	0
Sherman	0	0	(L)	(L)	(L)	(L)	(L)
Umatilla	24	21	36	30	52	72	72
Union	18	15	20	38	25	22	22
Wallowa	(L)	18	(L)	18	(L)	(L)	(L)
Wasco	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Wheeler	0	0	0	0	0	0	0
Utah							
Box Elder	(L)	13	(L)	(L)	(L)	13	(L)
Washington							
Adams	(L)	13	27	26	16	13	10
Asotin	(L)	(L)	(L)	11	11	(L)	(L)

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Benton	25	40	37	61	17	14	(L)
Chelan	26	42	16	30	26	23	36
Columbia	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Douglas	33	23	56	22	14	14	17
Ferry	75	75	72	68	70	73	72
Franklin	10	(L)	(L)	10	14	(L)	11
Garfield	0	0	0	0	0	0	0
Grant	40	25	43	47	45	47	44
Kittitas	(L)	(L)	21	(L)	(L)	(L)	(L)
Klickitat	(L)	12	24	15	12	11	14
Lincoln	(L)	13	(L)	16	11	(L)	(L)
Okanogan	29	32	47	44	21	23	27
Pend Oreille	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Skamania	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Spokane	230	237	290	238	256	238	210
Stevens	217	244	176	173	142	162	167
Walla Walla	12	33	27	(L)	(L)	(L)	(L)
Whitman	50	36	63	45	33	103	78
Yakima	61	74	73	54	74	65	56
Wyoming							
Fremont	1,889	1,829	1,794	1,943	1,732	1,863	1,902
Lincoln	264	278	290	329	428	535	569
Sublette	115	132	134	132	176	193	250
Teton	32	24	25	19	(L)	(L)	(L)
	1976	1977	1978	1979	1980	1981	1982
Idaho							
Ada	152	169	212	299	443	534	457
Adams	50	47	42	32	49	49	(D)

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Bannock	43	36	29	32	31	19	30
Benewah	17	18	15	18	29	32	(D)
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	20	20	16	20	31	58	55
Boise	(L)	(L)	(L)	(L)	23	(L)	(L)
Bonner	17	16	10	(L)	12	14	12
Bonneville	52	105	114	72	59	81	120
Boundary	0	0	(L)	0	0	0	0
Butte	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Camas	(L)	0	0	0	0	0	0
Canyon	92	101	129	149	151	130	148
Caribou	372	366	590	765	904	849	591
Cassia	46	50	53	51	55	53	54
Clark	(L)	(L)	(L)	(L)	(L)	37	(L)
Clearwater	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Custer	98	68	64	74	102	241	504
Elmore	(D)	(D)	(D)	(D)	(D)	(D)	(L)
Fremont (incl. YNP)	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Gem	18	18	16	14	(L)	(L)	(L)
Gooding	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Idaho	27	21	24	28	33	39	18
Jefferson	(L)	(L)	(L)	(L)	(L)	(L)	15
Jerome	(L)	(L)	(L)	(L)	(L)	(L)	10
Kootenai	(L)	(L)	(L)	10	14	15	27
Latah	13	15	17	34	35	44	38
Lemhi	25	28	23	100	209	159	71
Lewis	0	0	0	0	0	(L)	(L)
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	77

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Madison	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Minidoka	26	15	15	(L)	(L)	(L)	(L)
Nez Perce	10	15	11	(L)	(L)	(L)	(L)
Oneida	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Owyhee	37	165	137	174	192	214	207
Payette	(L)	11	10	13	(L)	(L)	(L)
Power	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Shoshone	2,178	2,126	2,373	2,500	2,465	2,813	1,712
Teton	(D)	(D)	(D)	(D)	(D)	(D)	(L)
Twin Falls	23	23	19	29	25	29	41
Valley	(L)	12	(L)	15	14	13	10
Washington	25	(L)	(L)	(L)	(L)	(L)	(L)
Montana							
Deer Lodge	75	79	70	66	42	20	14
Flathead	22	18	18	25	17	48	42
Granite	69	74	77	86	105	116	(D)
Lake	(L)	13	14	14	16	20	19
Lewis and Clark	64	55	55	62	107	107	131
Lincoln	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Mineral	(L)	(L)	(L)	(L)	26	(L)	0
Missoula	41	101	159	124	167	167	220
Powell	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Ravalli	14	18	22	26	16	44	25
Sanders	31	33	38	35	35	41	20
Silver Bow	2,164	1,850	1,803	1,846	1,300	1,520	961
Nevada							
Elko	237	258	211	299	476	762	843
Oregon							

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Baker	41	54	51	98	114	158	(D)
Crook	12	12	(L)	(L)	22	24	(D)
Deschutes	57	67	95	164	115	73	61
Gilliam	0	0	0	0	0	0	0
Grant	15	26	21	25	46	35	22
Harney	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Hood River	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Jackson	163	113	113	100	124	139	148
Jefferson	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Klamath	10	14	16	35	40	42	48
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	(L)	11	(L)	14	20	10	(L)
Morrow	0	0	0	0	0	0	0
Sherman	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Umatilla	54	36	31	32	38	47	34
Union	21	18	14	25	14	22	21
Wallowa	(L)	(L)	(L)	(L)	(L)	(L)	11
Wasco	16	12	12	14	12	14	10
Wheeler	0	0	0	0	0	0	0
Utah							
Box Elder	15	23	21	14	(L)	18	(L)
Washington							
Adams	(L)	11	10	11	13	18	17
Asotin	(L)	(L)	(L)	(L)	(L)	12	13
Benton	(L)	32	46	56	32	23	22
Chelan	36	41	44	46	47	65	(D)
Columbia	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Douglas	15	18	42	44	40	15	11

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Ferry	73	83	83	92	170	231	(D)
Franklin	20	30	31	30	30	17	14
Garfield	0	0	0	0	0	0	(D)
Grant	44	53	87	223	205	249	293
Kittitas	(L)	12	19	23	27	31	27
Klickitat	(L)	(L)	13	10	(L)	13	(L)
Lincoln	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Okanogan	31	89	206	23	25	33	37
Pend Oreille	(D)	(D)	(D)	(D)	(D)	(D)	(L)
Skamania	(D)	(D)	(D)	(D)	(D)	(D)	(L)
Spokane	268	358	373	406	438	588	515
Stevens	197	211	259	506	543	509	398
Walla Walla	(L)	13	10	11	12	16	16
Whitman	41	34	24	22	26	27	24
Yakima	89	102	122	157	131	131	139
Wyoming							
Fremont	2,325	2,996	3,669	4,034	3,984	3,321	2,629
Lincoln	897	1,012	1,061	1,213	1,359	1,383	1,079
Sublette	151	137	173	192	276	356	329
Teton	(L)	31	36	(L)	23	24	80
	1983	1984	1985	1986	1987	1988	1989
Idaho							
Ada	458	463	401	380	236	223	231
Adams	(D)	(D)	(D)	(D)	10	(L)	15
Bannock	32	34	33	33	30	26	29
Benewah	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Bingham	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Blaine	80	52	51	(D)	58	64	65

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Boise	13	13	12	(L)	(L)	10	(L)
Bonner	25	22	24	26	36	37	36
Bonneville	110	93	96	65	50	79	27
Boundary	0	0	0	(D)	(L)	(L)	(L)
Butte	(L)	(D)	(D)	(D)	(L)	(L)	(D)
Camas	0	0	0	0	(L)	(D)	(D)
Canyon	162	156	153	100	57	47	59
Caribou	655	723	610	345	454	531	484
Cassia	49	38	30	21	(L)	(L)	19
Clark	(L)	(L)	11	(D)	(D)	(D)	(D)
Clearwater	(L)	(L)	(L)	10	15	14	13
Custer	584	597	495	(D)	(D)	(D)	(D)
Elmore	0	(L)	10	17	(D)	42	40
Fremont (incl. YNP)	(L)	(L)	(L)	(D)	(L)	(L)	(L)
Gem	(L)	15	16	15	(D)	18	17
Gooding	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Idaho	115	111	124	129	(D)	91	99
Jefferson	28	13	14	38	15	13	18
Jerome	10	(L)	(L)	(L)	(L)	(L)	(L)
Kootenai	35	45	54	153	171	183	206
Latah	43	35	31	(D)	33	35	28
Lemhi	50	44	29	(D)	29	34	36
Lewis	0	0	0	0	0	0	(L)
Lincoln	(L)	0	(L)	(D)	(L)	(L)	(L)
Madison	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Minidoka	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Nez Perce	19	15	15	16	18	56	67
Oneida	(D)	(D)	(D)	(D)	(D)	(D)	(D)

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Owyhee	222	222	191	177	(D)	(D)	(D)
Payette	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Power	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Shoshone	1,687	1,818	1,760	999	792	1,181	1,465
Teton	(L)	(L)	(L)	(L)	0	0	0
Twin Falls	45	49	46	73	71	74	75
Valley	24	29	17	(D)	63	93	111
Washington	(L)	(L)	(L)	(D)	11	(L)	(L)
Montana							
Deer Lodge	27	28	21	(D)	13	13	15
Flathead	92	85	100	103	110	107	107
Granite	(D)	(D)	94	91	107	89	68
Lake	19	36	39	40	40	61	41
Lewis and Clark	156	170	132	137	162	186	177
Lincoln	(D)	(D)	(D)	(D)	502	481	481
Mineral	0	0	0	(L)	(L)	(L)	(L)
Missoula	240	276	228	193	129	107	105
Powell	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Ravalli	41	42	46	53	59	50	63
Sanders	21	23	29	30	30	36	22
Silver Bow	482	202	320	441	502	507	(D)
Nevada							
Elko	724	839	834	801	1,059	1,126	1,234
Oregon							
Baker	(D)	(D)	(D)	104	(D)	87	91
Crook	(D)	(D)	(D)	(D)	(L)	(L)	22
Deschutes	61	74	66	56	65	56	77
Gilliam	0	0	0	0	(D)	(D)	(D)

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Grant	18	(L)	(L)	(L)	(L)	(L)	(L)
Harney	(L)	(L)	(L)	(L)	(D)	(D)	(L)
Hood River	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Jackson	142	165	167	164	188	209	185
Jefferson	16	16	17	12	15	16	(L)
Klamath	60	57	50	33	37	26	24
Lake	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Malheur	(L)	(L)	14	36	66	66	60
Morrow	0	0	0	0	0	(L)	(L)
Sherman	(L)	(L)	(L)	(L)	0	0	(D)
Umatilla	47	41	52	62	63	35	35
Union	23	27	26	26	24	23	20
Wallowa	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Wasco	12	23	15	13	15	12	10
Wheeler	0	0	0	0	0	0	0
Utah							
Box Elder	10	22	21	(D)	29	(D)	28
Washington							
Adams	12	13	10	(L)	(L)	(L)	(L)
Asotin	12	11	(L)	(L)	(L)	(L)	(L)
Benton	28	30	35	47	63	59	47
Chelan	(D)	66	148	256	286	(D)	(D)
Columbia	(L)	(L)	(L)	(L)	0	0	0
Douglas	18	16	13	10	(L)	(L)	(L)
Ferry	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Franklin	(L)	(L)	(L)	24	(L)	(L)	(D)
Garfield	(D)	(D)	(D)	0	0	(D)	(D)
Grant	309	(D)	248	198	(D)	(D)	(D)

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Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Kittitas	(L)	35	40	17	18	18	19
Klickitat	(L)	(D)	(D)	(D)	16	13	11
Lincoln	10	10	(L)	(L)	(L)	(L)	(D)
Okanogan	35	39	38	30	31	30	34
Pend Oreille	(L)	(L)	(L)	(L)	(L)	(L)	(L)
Skamania	(L)	(D)	(D)	11	14	27	33
Spokane	457	472	451	474	517	545	553
Stevens	280	214	158	150	164	157	146
Walla Walla	19	18	24	24	31	37	24
Whitman	31	23	20	12	(L)	(L)	(L)
Yakima	139	174	169	146	130	101	100
Wyoming							
Fremont	2,192	1,528	1,127	716	643	563	444
Lincoln	904	901	780	622	586	602	557
Sublette	234	295	322	483	360	357	478
Teton	43	35	25	36	60	57	51
	1990	1991	1992				
Idaho							
Ada	244	222	191				
Adams	(L)	(L)	(D)				
Bannock	32	33	32				
Benewah	(D)	(D)	(D)				
Bingham	(D)	(D)	121				
Blaine	76	78	73				
Boise	(L)	11	(L)				
Bonner	39	46	49				
Bonneville	27	29	27				
Boundary	(L)	(L)	(L)				

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Butte	(D)	(D)	(D)				
Camas	(D)	(D)	(L)				
Canyon	66	72	71				
Caribou	513	525	548				
Cassia	37	60	82				
Clark	(D)	(D)	(D)				
Clearwater	13	18	14				
Custer	(D)	(D)	318				
Elmore	42	14	13				
Fremont (incl. YNP)	(L)	(L)	(L)				
Gem	19	(D)	(D)				
Gooding	(L)	(L)	(D)				
Idaho	109	(D)	105				
Jefferson	15	15	15				
Jerome	(L)	(L)	(L)				
Kootenai	212	191	170				
Latah	16	17	36				
Lemhi	56	45	37				
Lewis	(L)	(L)	(D)				
Lincoln	(L)	(L)	(L)				
Madison	(L)	(L)	(D)				
Minidoka	(L)	(L)	(D)				
Nez Perce	73	(D)	(D)				
Oneida	(D)	(D)	(D)				
Owyhee	(D)	(D)	169				
Payette	(L)	(L)	19				
Power	(D)	(D)	(D)				
Shoshone	1,538	886	621				

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Teton	0	0	0				
Twin Falls	80	86	94				
Valley	176	126	79				
Washington	(L)	(L)	(L)				
Montana							
Deer Lodge	18	20	65				
Flathead	99	(D)	128				
Granite	56	52	65				
Lake	35	38	40				
Lewis and Clark	169	145	135				
Lincoln	469	420	386				
Mineral	(L)	(L)	(D)				
Missoula	81	74	76				
Powell	(D)	(D)	179				
Ravalli	80	77	65				
Sanders	21	22	17				
Silver Bow	(D)	(D)	562				
Nevada							
Elko	1,347	1,440	1,446				
Oregon							
Baker	111	108	104				
Crook	24	(D)	26				
Deschutes	74	71	68				
Gilliam	0	0	0				
Grant	14	(L)	(L)				
Harney	(L)	(L)	(L)				
Hood River	(L)	(L)	(D)				
Jackson	174	164	164				

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year						
Jefferson	(L)	(L)	(D)				
Klamath	22	21	30				
Lake	(D)	(D)	30				
Malheur	61	68	65				
Morrow	(L)	(L)	(L)				
Sherman	(D)	0	(D)				
Umatilla	37	30	29				
Union	19	21	20				
Wallowa	(L)	(L)	(L)				
Wasco	11	(D)	17				
Wheeler	0	0	0				
Utah							
Box Elder	23	21	(D)				
Washington							
Adams	(L)	(D)	(D)				
Asotin	(L)	(L)	(L)				
Benton	42	50	(D)				
Chelan	(D)	260	249				
Columbia	(L)	(L)	(D)				
Douglas	(L)	(L)	(L)				
Ferry	(D)	354	327				
Franklin	(D)	13	18				
Garfield	0	0	0				
Grant	(D)	(D)	(D)				
Kittitas	16	17	16				
Klickitat	15	20	24				
Lincoln	(L)	(L)	(L)				
Okanogan	39	50	65				

Appendix A-7. Mining Earnings ($m), by Interior CRB county, 1969-92 (continued).

State/County	Mining Earnings ($m) by Year					
Pend Oreille	(L)	(L)	15			
Skamania	19	(D)	(D)			
Spokane	490	437	403			
Stevens	156	210	172			
Walla Walla	18	21	17			
Whitman	(L)	(L)	(L)			
Yakima	82	71	49			
Wyoming						
Fremont	578	575	479			
Lincoln	657	680	638			
Sublette	339	361	314			
Teton	51	54	53			

(1) includes mineral fuels.
(L) less than $50,000
(D) withheld to avoid disclosure of confidential information.

Source: Bureau of Economic Analysis, Regional Economic Information System. 1994.

Appendix A-8. Production of precious metals in Shoshone County, ID, in terms of recoverable metals, 1884- 1983.

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1884	na	12,500					$258,375
1885	na	18,220					376,607
1886	na	8,823	116,246		1,500		436,335
1887	na	7,367	340,000		5,980		1,022,996
1888	na	10,250	554,000		8,000		1,438,227
1889	na	8,433	1,095,265		17,500		2,532,978
1890	na	8,000	1,499,663		27,500		4,132,506
1891	na	10,000	1,825,765		33 000		4,868,356
1892	na	11,000	1,195,904		27,839		3,538,684
1893	na	14,748	1,963,561		29,563		4,258,621
1894	na	17,531	2,343,314		30,000		3,816,026
1895	na	18,439	2,471,300		31,000		4,016,049
1896	na	17,369	3,163,657		37,250		4,703,971
1897	na	16,404	3,756,212		57,777		6,764,010
1898	na	13,011	3,521,982		56,339		6,565,287
1899	na	8,602	2,737,218		50,006		6,263,404
1900	na	5,754	5,261,417		81,535		10,588,707
1901	na	4,915	4,339,296		68,953		8,731,662
1902	na	4,761	5,033,928		74,739		8,847,552
1903	na	7,651	5,471,620		103,691		11,885,078
1904	1,410,245	2,226	6,143,001	712	112,584		13,592,014
1905	1,526,927	1,886	7,292,986	2,613	126,928	72	17,198,856
1906	1,622,975	4,190	7,944,338	3,197	126,011	1,027	21,133,963
1907	1,541,670	3,952	7,266,862	3,600	114,721	3,474	18,888,203
1908	1,551,680	3,878	6,364,552	4,521	102,069		13,220,853
1909	1,569,332	4,326	6,201,157	4,453	106,779	640	13,724,065

Appendix A-8. Production of precious metals in Shoshone County, ID, in terms of recoverable metals, 1884- 1983 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1910	1,639,781	3,148	6,703,080	3,009	109,879	2,763	14,416,910
1911	2,004,487	4,162	7,383,899	1,463	127,419	4,155	16,306,680
1912	2,108,037	4,084	7,558,314	2,193	132,276	6,900	18,313,604
1913	2,289,226	3,955	9,337,109	2,549	148,370	10,708	20,767,410
1914	2,152,268	3,104	12,178,194	2,121	169,849	20,762	22,728,903
1915	2,255,475	2,246	11,158,955	971	164,199	34,843	30,119,424
1916	2,516,325	2,247	11,639,841	1,185	178,117	43,119	44,424,716
1917	2,522,127	4,145	11,241,126	1,438	186,004	38,862	50,054,297
1918	1,918,052	11,874	8,447,219	1,353	139,307	21,831	33,115,903
1919	1,308,063	8,687	4,815,200	737	83,833	7,997	15,900,815
1920	1,822,488	5,897	6,386,663	286	118,105	13,966	28,347,791
1921	1,379,178	8,306	4,986,263	202	94,543	17	13,720,730
1922	1,249,536	7,056	4,690,097	171	91,216	2,033	15,147,542
1923	1,535,011	13,182	6,117,621	300	114,426	13,976	23,297,547
1924	1,596,280	8,602	6,695,830	328	118,327	7,654	24,677,235
1925	1,714,159	6,615	6,701,747	310	120,856	15,578	28,272,585
1926	1,850,519	3,441	6,952,074	481	128,834	26,267	29,097,421
1927	1,919,309	416	8,256,126	653	141,948	26,131	26,091,273
1928	1,949,980	428	8,513,048	522	139,276	28,665	24,792,445
1929	1,971,580	511	8,776,726	660	141,558	43,046	28,439,351
1930	1,794,929	563	8,831,461	785	129,311	33,145	19,728,887
1931	1,239,592	456	7,003,541	522	97,771	18,934	10,809,561
1932	912,664	394	6,547,674	565	71,505	10,251	6,831,168
1933	1,052,889	1,584	6,762,537	772	73,926	20,958	9,737,204
1934	1,071,059	3,965	7,062,640	736	70,331	24,799	12,159,340
1935	1,237,244	2,714	9,892,910	987	78,290	31,009	16,361,388

Appendix A-8. Production of precious metals in Shoshone County, ID, in terms of recoverable metals, 1884- 1983 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1936	1,454,987	2,454	13,740,222	1,315	86,634	44,310	23,370,963
1937	1,731,801	3,659	18,457,726	1,944	96,505	47,070	32,382,311
1938	1,514,278	4,053	17,325,379	1,883	82,274	31,937	22,346,313
1939	1,611,068	5,928	15,204,934	2,068	81,699	40,065	22,805,024
1940	1,917,235	6,886	15,616,852	2,680	95,609	62,948	29,444,265
1941	2,051,390	3,419	14,678,356	2,979	95,529	68,321	32,398,932
1942	2,327,417	2,688	12,977,287	2,993	106,474	78,313	38,880,253
1943	2,270,385	2,250	10,302,840	1,987	89,813	79,634	38,594,728
1944	2,765,483	2,075	8,669,371	1,289	76,813	85,227	38,307,297
1945	2,794,208	1,898	7,115,646	1,018	63,430	78,030	34,258,050
1946	2,559,636	1,758	5,655,672	810	56,548	67,429	33,673,731
1947	2,957,143	2,808	9,234,906	1,312	73,060	79,251	49,226,932
1948	3,165,780	3,362	10,598,338	1,388	82,587	83,801	62,168,955
1949	2,282,614	2,438	9,146,146	1,171	74,152	74,370	50,699,924
1950	2,542,169	3,416	15,056,131	1,896	94,697	86,103	64,555,947
1951	2,393,939	2,684	13,639,808	1,874	70,570	74,989	65,058,887
1952	2,327,536	2,476	13,752,081	1,862	67,330	70,316	58,459,368
1953	1,788,426	2,376	13,636,680	2,100	69,885	68,650	47,729,814
1954	1,630,250	2,047	14,898,699	2,566	64,812	58,736	45,515,124
1955	1,637,121	1,777	12,984,323	2,637	59,820	50,527	44,036,867
1956	1,674,781	1,963	12,663,214	2,889	60,221	46,738	45,700,809
1957	1,710,442	2,254	14,397,771	3,473	67,125	54,825	47,117,496
1958	1,336,544	2,363	15,615,220	3,884	52,488	49,532	38,644,972
1959	1,421,957	2,349	16,460,825	3,678	61,155	55,454	44,058,455
1960	979,857	2,591	13,458,522	2,606	41,692	36,639	33,153,169
1961	1,434,379	3,279	17,369,240	3,673	70,651	58,184	46,312,680

Appendix A-8. Production of precious metals in Shoshone County, ID, in terms of recoverable metals, 1884- 1983 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1962	1,537,301	3,962	17,578,155	3,435	83,339	62,713	51,085,455
1963	1,462,873	3,427	16,523.143	3.332	74,794	63,118	53,980,184
1964	na	2,952	16,121,580	3.336	69,586	58,054	57,146,000
1965	na	2,713	17,917,551	3,540	63.474	56,443	62,054,000
1966	na	2,775	19,092.200	3,454	67,891	58,877	64,880,000
1967	na	2,444	16.483.477	2.714	57.587	54.807	59.008.000
1968	na	2.017	15,429,064	2,797	51,468	55,914	64,206,000
1969	na	3,046	18.405.398	3.251	62,497	53,584	70,439,000
1970	1,439.882	2,764	18,776,025	3.482	59.215	40.197	68.180.702
1971	1.535,484	2,968	18,935.732	3.404	65.413	44.297	65.254.451
1972	1.283,154	2,408	14,078.444	2.644	60.510	38.120	58.292,951
1973	1,473,926	2.477	13,449.859	2.505	60,860	45,016	76.057,170
1974	1.593.917	2.419	12.280.711	2.344	51.008	38.549	112.483.906
1975	1,687,182	2,083	13.596.486	2.510	48,899	38.946	115.060.798
1976	1,689,228	2,555	11,330.849	2,381	52,844	44,587	110,331,562
1977	1,442,176	2,646	14,273,142	3,105	46,771	30,368	120.092.785
1978	1,440,916	2,891	16,309,864	3,349	44,430	32,089	148,483,952
1979	1,404,648	2,808	15.197.476	3,231	42,299	29,569	249,433,762
1980	1,405,856	2,639	12,021,191	2,729	38,140	27,677	314,435,496
1981	1,626,781	w	14,836.789	3,423	37,914	w	226,281,428
1982	718,466	2,726	13,048,549	3,024	w	w	128,528.705
1983	731,393	w	16,029,954	3,530	25,363	w	w
1984	w	w	w	w	w	w	w
1985	834,031	w	16,786,333	w	w	w	126,667,942
1986	461,250	w	9,355.615	w	w	351	60,109,374

Appendix A-8. Production of precious metals in Shoshone County, ID, in terms of recoverable metals, 1884- 1983 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value

(1) beginning in 1978, metric tons
na not available
w withheld to avoid disclosure of confidential information.

Source: US Bureau of Mines

Appendix A-9. Production of precious metals in Silver Bow County, MT, in terms of recoverable metals, 1882- 1982.

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1882-1903	na	847,193	171,826,169	1,669,609	517		$591,616,666
1904	4,102,604	46,974	10,530,582	145,066			44,200,503
1905	4,419,300	61,251	11,191,016	152,154	570	780	55 643 230
1906	5,019,234	60,496	10,715,721	144,890	448	3,290	64,810,013
1907	3,735,346	34,368	7,516,659	109,418	112	122	49,464,959
1908	3,858,058	32,006	8,500,729	125,075	299	820	38,289,087
1909	5,000,062	39,443	10,609,328	155,662	100	4,650	47,315,005
1910	4,709,429	37,014	10,400,840	142,132	175	15,810	44,206,144
1911	4,569,942	35,406	10,258,122	136,136	508	21,867	42,741,229
1912	5,243,935	38,441	11,352,106	154,111	648	13,396	60,539,927
1913	5,612,530	37,720	12,211,725	142,841	2,271	44,265	57,593,753
1914	4,749,189	31,791	10,511,032	116,094	2,693	54,771	43,147,603
1915	5,574,105	39,151	12,484,609	133,003	3,968	93,257	77,190,924
1916	7,209,835	47,071	14,983,771	174,769	4,598	112,293	127,547,714
1917	5,681,058	33,418	11,511,600	135,296	5,176	90,158	103,330,806
1918	7,394,038	43,639	15,013,855	160,554	11,373	102,482	115,496,193
1919	3,907,089	28,040	10,531,127	84,526	10,156	83,647	57,107,312
1920	5,013,847	31,299	10,575,894	88,202	8,795	91,906	60,929,101
1921	1,141,013	13,714	4,983,972	23,979	6,621	11,451	13,194,969
1922	4,010,759	26,304	10,395,880	82,687	10,070	58,971	41,095,544
1923	5,261,344	30,359	11,837,475	111,522	12,751	70,506	54,495,627
1924	4,192,371	35,391	11,859,370	123,682	13,649	63,918	51,575,310
1925	3,862,401	36,192	11,568,302	133,318	12,091	56,890	57,390,128
1926	3,985,585	32,877	11,060,900	126,495	13,678	71,653	55,936,816
1927	3,753,246	26,313	9,659,142	110,656	12,769	78,314	46,645,518
1928	3,896,048	28,869	9,558,619	123,533	12,330	73,948	52,218,170

Appendix A-9. Production of precious metals in Silver Bow County, MT, in terms of recoverable metals, 1882- 1982 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1929	4,271,213	26,059	9,918,906	148,158	8,239	50,550	65,687,913
1930	2,351,836	12,974	5,257,545	97,736	2,540	13,984	29,300,169
1931	1,869,348	10,010	3,698,742	92,181			18,056,499
1932	652,967	4,183	1,563,752	42,304	1		5,857,814
1933	613,752	4,465	2,361,320	32,620	4,185	15,481	6,726,018
1934	644,487	3,861	2,826,252	31,428	5,391	21,165	9,209,595
1935	1,611,448	9,040	6,547,794	76,964	10,302	37,646	21,935,776
1936	2,796,273	15,183	7,990,124	109,004	10,527	34,940	31,238,996
1937	3,684,972	20,521	8,071,519	143,879	5,780	22,033	45,326,482
1938	1,642,491	15,147	4,018,192	76,855	207	942	18,300,823
1939	2,498,922	22,036	6,114,455	97,267	4,708	20,016	27,677,359
1940	3,764,610	25,107	8,766,398	125,442	8,859	35,899	40,871,719
1941	4,421,641	29,485	8,993,693	127,432	8,630	38,070	44,195,725
1942	4,753,741	22,381	8,123,788	140,349	7,206	29,313	46,942,464
1943	5,163,966	16,132	6,487,380	133,569	3,290	7,877	42,100,656
1944	5,429,931	15,463	6,001,695	117,366	3,348	8,087	38,877,303
1945	4,528,282	12,484	4,976,910	87,950	2,926	8,493	30,179,133
1946	1,827,606	6,926	2,417,969	57,905	2,357	7,108	23,205,317
1947	2,624,915	19,801	5,252,011	57,187	10,635	40,713	42,379,878
1948	2,637,479	19,163	6,100,232	57,712	13,224	52,625	49,971,332
1949	2,297,584	15,757	5,636,112	55,945	11,490	47,982	43,225,091
1950	3,387,270	23,163	6,123,549	53,897	15,679	63,510	51,044,252
1951	3,780,943	15,674	5,950,647	56,826	16,630	80,500	68,493,990
1952	4,425,605	16,930	5,518,197	61,559	16,162	75,968	65,806,893
1953	5,998,457	19,871	6,289,415	77,520	16,767	75,170	72,566,257
1954	4,987,849	17,395	4,663,439	59,240	11,516	53,527	54,498,289

Appendix A-9. Production of precious metals in Silver Bow County, MT, in terms of recoverable metals, 1882- 1982 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1955	7,159,693	22,262	5,577,999	81,428	14,331	62,588	86,240,115
1956	9,394,981	31,132	6,772,380	96,292	14,989	63,375	111,138,462
1957	10,673,175	27,312	5,068,834	91,393	9,617	43,169	73,327,727
1958	10,745,428	17,374	3,307,748	90,557	5,492	26,580	57,942,199
1959	8,679,400	18,615	3,204,038	65,810	4,456	22,459	50,149,131
1960	12,168,767	21,819	2,918,104	91,754	1,889	4,755	63,979,580
1961	12,635,383	18,391	2,765,478	103,788	435	1,384	65,881,072
1962	11,654,394	17,657	4,026,697	93,845	4,319	28,636	70,176,106
1963	9,346,244	14,287	3,951,004	79,636	3,185	24,140	60,849,789
1964	na	20,999	4,613,997	103,600	2,678	20,239	80,455,000
1965	na	18,420	4,790,382	115,279	4,594	25,629	97,373,000
1966	na	21,608	4,863,997	127,885	2,411	22,284	106,749,000
1967	na	8,339	1,856,486	65,448	64	816	53,450,000
1968	na	9,782	1,466,172	69,362			61,580,000
1969	na	15,428	2,563,453	103,179		w	103,321,000
1970	18,723,641	19,454	3,589,679	120,292			145,881,286
1971	13,508,210	13,789	2,414,706	88,503			96,344,479
1972	17,207,921	22,535	3,159,482	123,058	2		132,656,003
1973	19,055,467	24,341	4,070,183	132,282			170,208,153
1974	23,188,390	24,609	3,259,012	131,062			221,902,354
1975	19,289,725	13,528	2,161,943	87,927	12	4	124,647,343
1976	16,803,487	19,845	2,937,047	90,909	3	1	141,810,400
1977	15,492,299	21,181	3,081,451	85,917			132,162,518
1978	11,233,015	16,949	2,281,180	66,741			113,445,776
1979	15,544,651	21,336	2,655,499	69,133			177,799,638
1980	13,728,889	14,394	2,027,529	59,477			139,554,860

Appendix A-9. Production of precious metals in Silver Bow County, MT, in terms of recoverable metals, 1882-1982 (continued).

Year	Material treated (st) (1)	Gold (troy oz)	Silver (troy oz)	Copper (st) (1)	Lead (st) (1)	Zinc (st) (1)	Total Value
1981	12,854,357	3,361	739,338	48,144			86,013,171
1982	w						w
1983	6,287,086	1,383	313,093	18,694	111		35,760,979

(1) Beginning in 1978, metric tons
na not available
w withheld to avoid disclosing confidential information.

Source: US Bureau of Mines

Appendix A-l 0. Value of mineral production ($m) in interior counties 1952-1979.

State/County	Value of Mineral Production by Year						
	1952	1953	1954	1955	1956	1957	1958
Idaho							
Ada	445	446	421	321	334	342	611
Adams	W	W		W	71	202	W
Bannock		W	W	W	W	W	W
Benewah		W	W	W	W	W	W
Bingham		W	W	W	W	W	W
Blaine	2,678	2,175	2,009	W	1,830	W	289
Boise	6	14	30	6	530	W	34
Bonner	420	335	410	939	286	355	W
Bonneville	269	2,000	489	673	738	1,084	735
Boundry		60	134	73	29	30	57
Butte	1	W	3	14	69		W
Camas	2	53	W	58	39	W	192
Canyon	90	219	251	203	255	185	170
Caribou		W	W	W	W	W	W
Cassia	144	282	332	230	143	68	295
Clark		10	W	W	W	331	W
Clearwater	86	245	W	W	228	271	10
Custer	1,194	664	714	W	1,348	1,104	568
Elmore	195	132	128	213	152	402	689
Fremont		2	49	47	275	208	65
Gem	109	63	167	73	80	95	44
Gooding	15	2	70	79	231	130	113
Idaho	124	239	961	337	970	311	399
Jefferson		2	W	74	W		91
Jerome			100	75	76	396	294
Kootenai	388	103	63	104	150	425	163

Appendix A-10. Value of mineral production ($m) in interior counties 1952-l 979 (continued).

State/County	Value of Mineral Production by Year						
Latah	127	341	573	218	742	484	495
Lemhi		3,580	4,931	6,343	7,875	5,839	6,738
Lewis		W	W	W	W	W	W
Lincoln		108	121	W	W		W
Madison			W	72	42	133	106
Minidoka		W	W	35	3	59	W
Nez Perce	290	W	137	W	233	134	37
Oneida		15	W	86			
Owyhee	21	79	155	104	72	W	8
Payette		W	W	W	9	W	
Power			181	26	41	209	351
Shoeshone	58.534	47.876	45,948	44,320	45.865	47,447	38.973
Teton		37			113		W
Twin Falls	110	565	400	250	581	331	274
Valley	1.580	347	395	711	584	1.182	1.222
Washington		W		146	715	578	1,056
State total	77,060	67,000	69,689	68,513	75,152	73,464	64,648
	1959	1960	1961	1962	1963	1964	1965
Ada	613	W	500	762	1,718	W	882
Adams	22	W	W	86	W	43	
Bannock	W	W	W	W	W	W	W
Benewah	W	212	168	165	176	248	W
Bingham	W	W	W	W	W	W	W
Blaine	257	W	36	208	W	738	W
Boise	2	35	W	6	29	14	2
Bonner	101	107	151	400	432	132	117
Bonneville	534	462	583	3,054	1,948	880	1,020
Boundry	171	99	79	264	50	59	283

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Butte	14	W	225	68		81	14
Camas		80	39		*	W	21
Canyon	263	232	465	704	943	858	1,247
Caribou	W	W	W	W	W	W	W
Cassia	548	957	711	133	548	W	W
Clark	79	36	77	5	19	112	758
Clearwater	W	188	179	330	95	198	328
Custer	436	549	650	459	496	538	783
Elmore	520	196	91	119	96	139	116
Fremont	W	27	80	621	6	117	
Gem	12	214	194	221	335	W	238
Gooding	201	W	74	43	71	47	185
Idaho	395	419	1.164	571	552	501	155
Jefferson	312		28	660	160	76	125
Jerome	8	204	19	51			173
Kootenai	574	300	215	753	207	345	121
Latah	W	153	611	304	399	W	W
Lemhi	4.449	1.002	160	376	660	W	W
Lewis	W	297	64	W	W	408	W
Lincoln	33	W		33	66	298	W
Madison	160	W	392	406	367	615	21
Minidoka	70	171	441	374	191	545	481
Nez Perce	26	21	66	410	354	563	616
Oneida	4	45	W	258	336	29	100
Owyhee	41	348	79	124	11	6	200
Payette	106	37		17	12	46	55
Power	1,880	272	196	278	417	26	13
Shoshone	44,341	33.393	46.691	51.386	54.466	57.565	62.910

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Teton	98	W			17		202
Twin Falls	356	267	318	731	656	686	1,260
Valley	641	35	W	81	126	83	134
Washington	484	840	W	W	W	32	1,226
State total	70,209	57,441	69,034	82,575	82,755	86,262	105,085
	1966	1967	1968	1969	1970	1971	1972
Ada	538	398	436	W	W	W	1,080
Adams	24		42	22	W	W	303
Bannock	2,734	W	W	2,867	W	4,399	4,588
Benewah	W	W	W	W	W	W	W
Bingham	W	W	W	W	W	W	W
Blaine	2,086	1,574	1,137	1,279	380	10	W
Boise	130	54	118	W	W	77	
Bonner	39	82	84	166	W	W	W
Bonneville	727	725	734	619	755	1,281	1,722
Boundry	66	28	31	W	28	90	W
Butte	W	W	108	W	W		
Camas	W	19	104	W	1	W	W
Canyon	638	1,221	1,031	727	710	1,655	W
Caribou	W	W	W	W	17,798	14,204	16,997
Cassia	122	979	107	W	W	147	90
Clark	897	16	94	58	11	58	92
Clearwater	1,347	1,605	1,889	W	W	W	W
Custer	830	1,051	1,506	1,331	W	1,344	775
Elmore	209	201	34	W	W	W	W
Fremont	7		17		64	W	W
Gem	249	239	220	276	4	W	W
Gooding	27		226	10		W	

Appendix A-10. Value of mineral production ($m) in interior counties 1952- 1979 (continued).

State/County	Value of Mineral Production by Year						
Idaho	815	237	111	473	W	W	W
Jefferson	126	794	1,020	W	W		336
Jerome	15	2,035	*	18		33	
Kootenai	394	165	412	355	W	W	W
Latah	W	1,540	W	821	1.164	W	1,713
Lemhi	W	1,211	W	88	86	175	80
Lewis	28			W			155
Lincoln	35	168	W	W	W	W	W
Madison	47			19	W	W	W
Minidoka	253	263	237	238	W	W	W
Nez Perce	328	527	403	440	W	W	776
Oneida	W	70	128	182	116	232	235
Owyhee	238		73	14	1		W
Payette	155	147	355	23	W	W	W
Power	24	92	16	W	W	12	W
Shoshone	65,759	59.603	65.081	71.701	70.185	66,073	59.232
Teton	80	132	92	255	281	292	W
Twin Falls	W	W	1,049	968	887	W	W
Valley	68	99	35	39			
Washington	1,062	945	689	547	W	W	252
State total	114,914	109,408	114,253	118.309	119,748	112,280	106,206
	1973	1974	1975	1976	1977*	1978	1979
Ada	1.293	960	2.101	W	2.269	2,791	W
Adams	1.286	777	916	1,761	1,898	W	W
Bannock	W	W	W	W	W	W	W
Benewah	547	W	W	W	W	W	W
Bingham	W	W	W	W	W	W	W
Blaine	W	279	600	W	W	W	W

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Boise		11	W	1	5	5	W
Bonner	273	712	142	W	W	345	W
Bonneville	1,371	3,396	W	W	W	2,712	3,258
Boundry	W	37	6	37	W	121	W
Butte	W	W	W			W	
Camas	40	33					
Canyon	W	W	W	W	W		W
Caribou	25,243	52.213	W	43.166	70.768	81,352	98.104
Cassia	413	405	W	W	W	W	W
Clark	93	W	W	W	W	W	84
Clearwater	W	W	701	881	412	466	430
Custer	1.231	1.701	2.897	2.704	W	1.130	1.750
Elmore	W	W	W	434	W	W	W
Fremont	W	W	341	192	533	533	702
Gem	315	499	939	897	W	1.697	1.918
Gooding	W	W	W	462	508	W	W
Idaho	W	1.350	1,264	W	1,021	W	W
Jefferson				113	422		
Jerome			W	W	166	115	
Kootenai	1,432	912	1,112	W	W	W	1,474
Latah	W	W	W	W	W	W	W
Lemhi	102	W	W	W	W	139	W
Lewis	W	W	W	58	125	171	117
Lincoln	W	W	W	W	W	148	3
Madison	207	366	W	403	827	1.822	1.639
Minidoka	W	619	W	W	W	W	W
Nez Perce	W	W	W	W	W	1,342	W
Oneida	W	W	W	W	W	W	W

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Owyhee	3	19	W	1	W	W	W
Payette	140	W	248	500	308	130	130
Power	30	42	38	31	W	350	44
Shoshone	76,763	W	W	110,977	W	W	W
Teton	286	W	260		287	40	
Twin Falls	W	810	W	W	W	W	W
Valley	W	W	W	W	W	146	249
Washington	378	513	W	W	W	W	W
State total	136,081	208,558	233,788	210,246	252,670	299,227	437,885
Montana	1952	1953	1954	1955	1956	1957	1958
Deer Lodge	262	330	750	1,259	645	W	862
Flathead	313	155	319	178	373	368	414
Granite		1,781	2,021	W	1,657	1,286	1,064
Lake				W	W	W	W
Lewis and Clark	2,110	1,046	1,684	1,478	W	W	1,517
Lincoln+			W	W	W	W	W
Mineral	151	180	87	W	88	W	45
Missoula	434	306	281	360	371		230
Powell	2,057	2,350	2,771	W	W	2,517	W
Ravalli			W	W	W	W	W
Sanders	395	439	566	W	537	1,599	755
Silver Bow	73,026	82,035	58,901	94,138	118,214	79,428	62,547
State total	121,400	132,184	126,412	166,993	213,781	191,728	176,728
	1959	1960	1961	1962	1963	1964	1965
Deer Lodge	532	852	836	783	781	1,077	1,694
Flathead	552	405	296	370	288	744	1,326
Granite	1,063	1,403	1,683	1,505	757	3,132	W
Lake	W	26	W	W	210	265	64

Appendix A-10. Value of mineral production ($m) in interior counties 1952- 1979 (continued).

State/County	Value of Mineral Production by Year						
Lewis and Clark	W	1,709	1,651	2,128	3,344	3,538	3,437
Lincoln	W	1,710	W	W	W	W	W
Mineral	57	W	W	65	50	997	1,073
Missoula	195	136	193	465	1,433	1,937	808
Powell	W	W	W	W	W	W	W
Ravalli	W	W	W	597	W	W	W
Sanders	W	W	W	15	140	82	W
Silver Bow	51,719	66,353	67,303	72,342	61,562	81,973	99,517
State total	167,890	178,854	184,233	190,656	182,027	211,452	228,163
	1966	1967	1968	1969	1970	1971	1972
Deer Lodge	2,252	2,045	1,895	2,395	2,516	2,695	3,768
Flathead	1,393	653	857	727	W	565	491
Granite	W	W	5,478	1,081	1,268	431	W
Lake	237	167	77	308	W	W	W
Lewis and Clark	2,093	818	875	2,114	W	548	257
Lincoln	W	5,545	5,325	6,561	12,691	12,277	5,483
Mineral	W	77	200	W	W	W	1,392
Missoula	947	640	W	3,278	536	237	W
Powell	W	W	W	W	W	W	W
Ravalli	W	W	W	W	W	W	W
Sanders	244	22	116	252	W	371	W
Silver Bow	107,297	53,878	61,894	103,487	146,072	96,448	133,264
State total	245,268	186,524	228,131	282,631	313,016	285,073	307,676
	1973	1974	1975	1976	1977*	1978	1979
Deer Lodge	3,603	3,774	5,697	W	7,902	6,893	8,178
Flathead	1,142	1,202	1,088	1,333	1,495	2,217	3,997
Granite	W	1,097	1,925	2,289	1,773	W	7,625
Lake	W	W	W	W	427	W	W

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Lewis and Clark	223	286	W	W	181	W	1.077
Lincoln	W	W	W	W	13,140	W	W
Mineral	355	139	43	266	31	81	612
Missoula	W	W	509	W	W	W	W
Powell	W	W	W	W	W	W	W
Ravalli	W	W	601	W	W	W	765
Sanders	324	602	903	356	709	W	W
Silver Bow	171.062	221,977	125.165	141.811	W	W	178.215
State total	385,285	574,801	573.150	636.289	213.253	205,800	291,287
Nevada	1953	1954	1955	1956	1957	1958	1959
Elko	762	599	952	1.126	669	953	1.252
State total	73.523	89,138	113,231	126,681	86,023	68.293	70.159
	1960	1961	1962	1963	1964	1965	1966
Elko	647	753	1.707	3.804	5,445	4,441	4.198
State total	80.335	81,533	83.733	85.440	85.137	99.966	112,632
	1967	1968	1969	1970	1971	1972	1973
Elko	4,126	2,270	2,792	584	490	1,253	1.244
State total	90,883	120,041	168,295	186,349	164,774	181,702	201.813
	1974	1975	1976	1977*	1978	1979	
Elko	4,415	W	W	13,084	W	6,427	
State total	257,876	258,917	233,683	263,816	237,411	260,246	
Oregon	1952	1953	1954	1955	1956	1957	1958
Baker		W	W	W	W	W	W
Crook	4	W	124	332	274	324	272
Deschutes	1,115	1,047	907	977	1,196	1,089	1,100
Gilliam	116	120		W	128	17	299
Grant	51	160	261	164	374	319	413
Harney	7	10	23	58	34	W	75

Appendix A-10. Value of mineral production ($m) in interior counties 1952- 1979 (continued).

State/County	Value of Mineral Production by Year						
Hood River	46	38	45	111	82	116	64
Jackson	2,236	2,520	2,958	3,154	3,331	3,165	3,129
Jefferson		27	W	184	207	454	166
Klamath	212	50	166	484	390	225	515
Lake		152	115	77	245	341	194
Malheur	4	3	W	1,041	637	909	846
Morrow	39	93	W	139	78	182	247
Sherman	3	18	80	1,277	275	234	159
Umatilla	385	282	551	622	836	398	1,013
Union	71	197	178	336	321	257	448
Wallowa	76	196	189	258	134	121	243
Wasco	108	220	506	309	189	1,162	509
Wheeler			W	21	736	92	206
State total	26,674	24,449	32,268	31,736	34,021	42,480	45,190
	1959	1960	1961	1962	1963	1964	1965
Baker	W	W	4,927	4,028	5,822	4,174	5,429
Crook	252	340	432	101	107	104	331
Deschutes	1,210	1,260	870	528	819	653	888
Gilliam	75	878	435	748	1,180	4,295	1,930
Grant	84	42	103	134	428	358	142
Harney	112	68	325	261	284	112	261
Hood River	197	151	535	487	886	236	1,168
Jackson	4,185	3,347	4,387	4,423	4,949	4,049	6,772
Jefferson	87	430	W	192	974	1,253	269
Klamath	240	226	944	738	1,379	1,245	911
Lake	W	320	343	235	90	210	1,167
Malheur	1,008	457	735	991	796	1,091	1,690
Morrow	188	282	500	71	W	1,821	556

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Sherman	345	587	456	76	2.058	3.102	3.527
Umatilla	1.059	1.171	608	1,286	1,332	516	665
Union	663	380	713	507	378	360	632
Wallowa	138	270	188	269	W	W	138
Wasco	815	426	236	664	1,087	560	1,947
Wheeler	188	98	107	126	126	59	120
State total	49,831	54,520	53,092	52.458	62,692	64,363	82,966
	1966	1967	1968	1969	1970	1971	1972
Baker	6,499	5,985	5,812	4.566	6.153	8.249	6.314
Crook	247	237	191	265	196	353	W
Deschutes	1.003	1.054	870	886	760	852	1.500
Gilliam	31.950	171	W	1	W	W	W
Grant	367	857	W	997	538	1.011	W
Harney	275	233	W	W	W	W	451
Hood River	1,465	364	206	W	W	W	W
Jackson	3.402	2,843	1.191	1.049	975	1.700	1.044
Jefferson	217	133	235	83	W	W	W
Klamath	2,124	1.716	1,097	2.139	2.945	2.228	1,649
Lake	1,020	808	722	503	239	806	949
Malheur	1.091	727	W	W	W	1,360	1,470
Morrow	W	69	53	152	W	W	48
Sherman	1,424	236	191	572	612	46	1,249
Umatilla	1,820	5.378	715	568	598	2.008	W
Union	461	445	W	504	632	1.676	2.115
Wallowa	330	W	308	168	513	474	111
Wasco	374	146	W	W	869	W	W
Wheeler	247	37	238	106	W	60	W
State total	107,484	66.560	64,449	60.164	68.101	78.035	76.516

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
	1973	1974	1975	1976	1977*	1978	1979
Baker	5,655	7,448	8,629	10,587	12,118	14,469	14,633
Crook	W	W	W	W	W	W	W
Deschutes	1,346	1,852	1,634	1,978	W	W	W
Gilliam	19	219	30	157	W	W	W
Grant	W	W	W	W	W	W	W
Harney	W	W	611	363	225	78	1,263
Hood River	250	W	W	379	237	505	260
Jackson	2,282	5,883	5,831	5,694	W	W	3,376
Jefferson	W	W	278	338	37	W	361
Klamath	2,307	W	W	W	W	W	W
Lake	719	W	W	W	W	W	W
Malheur	W	W	W	W	W	W	W
Morrow	W	W	W	W	377	302	W
Sherman	148		62	231	66	69	117
Umatilla	1,096	2,369	1,338	1,119	1,752	1,665	2,218
Union	527	W	W	506	406	607	744
Wallowa	29	W	47	184	117	102	W
Wasco	W	305	831	45	160	43	147
Wheeler	90	W	W	W	W	W	W
State total	81,577	103,920	106,004	112,566	109,132	128,843	165,321
NA not available							
Utah	1952	1953	1954	1955	1956	1957	1958
Box Elder	111	393	265	181	775	16,301	21,055
State total	265,502	298,629	255,495	331,929	399,759	356,213	367,232
	1959	1960	1961	1962	1963	1964	1965
Box Elder	2,352	607	1,208	1,125	1,137	1,938	W
State total	373,017	431,383	416,789	410,412	385,521	391,430	431,592

Appendix A- 10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
	1966	1967	1968	1969	1970	1971	1972
Box Elder	1,244	1,175	1,421	2,910	W	W	1,782
State total	444,262	354,47[illegible]	423,951	542,489	601,997	525,700	542,809
	1973	1974	1975	1976	1977*	1978	1979
Box Elder	1,840	1,975	2,116	2,468	1,923	1,817	1,260
State total	674,345	952,045	966,407	1,043,981	497,220	552,627	749,282
Washington	1952	1953	1954	1955	1956	1957	1958
Adams	171	69	57	130	541	595	594
Asotin	97	80	98	6	262	160	42
Benton	582	310	136	151	493	115	344
Chelan	3,750	3,893	4,053	5,068	4,522	3,066	1,250
Columbia			W	170			W
Douglas	98	653	227	2,073	W	674	1,030
Ferry		W	W	W	W	W	W
Franklin	66	145	185	669	493	531	717
Garfield	28	32	W	8	48	W	62
Grant	619	815	744	1,990	2,076	2,053	4,132
Kittitas	4,230	3,076	2,672	3,454	W	2,253	1,416
Klickitat	123	48	1,472	2,448	1,137	1,203	345
Lincoln	242	98	134	121	431	275	603
Okanogan	172	186	607	239	394	289	138
Pend Orielle	11,190	8,868	8,028	8,646	W	W	W
Skamania	31	31	95	61	30	1,684	257
Spokane	3,656	3,341	3,751	5,232	W	4,365	4,715
Stevens	5,980	7,158	5,017	8,164	7,222	4,538	3,357
Walla Walla	85	350	178	211	213	239	1,483
Whitman	296	436	186	436	323	285	398
Yakima	292	265	830	760	838	1,138	1,158

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
State total	56,129	54,577	53,300	67,334	61,723	58,690	60,896
	1959	1960	1961	1962	1963	1964	1965
Adams	1,239	396	455	194	229	65	405
Asotin	W	W	23	16	19	62	8
Benton	256	125	179	108	179	283	1,112
Chelan	1,749	W	1,254	1,043	W	1,445	W
Columbia					1,435	2,203	2,057
Douglas	685	849	237	217	791	178	112
Ferry	W	W	W	W	W	W	W
Franklin	1,131	1,838	1,508	874	580	916	502
Garfield	52	51	118	102	164	71	192
Grant	1,682	1,043	1,242	1,687	1,591	1,786	2,132
Kittitas	1,214	1,071	1,002	1,373	1,020	255	142
Klickitat	1,692	2,828	1,560	4,290	742	1,507	795
Lincoln	230	484	315	318	122	230	244
Okanogan	506	238	495	126	175	223	322
Pend Orielle	W	10,194	8,417	W	W	W	8,241
Skamania	703	188	160	341	87	169	186
Spokane	4,980	3,872	4,481	3,540	3,773	6,292	4,630
Stevens	3,391	5,093	5,163	3,938	4,364	5,294	6,744
Walla Walla	1,547	6,486	1,197	855	4,593	4,038	2,530
Whitman	496	190	304	437	1,085	364	1,895
Yakima	964	1,290	1,630	1,708	1,563	1,356	1,610
State total	63,894	70,485	66,448	68,474	71,430	81,310	86,172
	1966	1967	1968	1969	1970	1971	1972
Adams	284	395	506	W	W	W	2,543
Asotin	W	W	64	3	13	2	20
Benton	1,832	534	452	W	W	W	W

Appendix A-10. Value of mineral production ($m) in interior counties 1952- 1979 (continued).

State/County	Value of Mineral Production by Year						
Chelan	W	496	W	595	W	340	366
Columbia	1,825	6,262	W	W	W	W	109
Douglas	321	149	W	W	W	W	W
Ferry	W	W	W	W	W	W	W
Franklin	783	2,240	W	W	W	W	W
Garfield	333	2.029	188	1.030	630	W	W
Grant	1,983	2.185	2.068	2.265	2.702	2.789	5.416
Kittitas	655	1,903	1.054	1.179	W	226	130
Klickitat	924	663	203	428	483	W	291
Lincoln	182	207	508	542	148	W	175
Okanogan	240	327	181	1.041	489	W	W
Pend Orielle	7.880	4.728	5.645	7.815	W	9.090	8.478
Skamania	W	165	528	303	W	W	249
Spokane	5.703	3.276	2.776	1.917	W	2,955	3.260
Stevens	6.685	W	4.021	3.750	W	5.619	5.207
Walla Walla	1,982	676	526	437	453	407	W
Whitman	2.081	983	5.947	7.459	1.375	1.458	W
Yakima	2,434	1,264	1,378	1.798	W	2,257	1,735
State total	89,092	82.067	81.385	88.626	90,922	94,601	109.806
	1973	1974	1975	1976	1977*	1978	1979
Adams	W	W	W	W	63	W	W
Asotin	58	5.997	67	80	517	486	288
Benton	W	W	W	W	W	W	W
Chelan	W	W	359	715	1.421	790	W
Columbia	96	111	101	687	102	124	188
Douglas	62	173	W	2.300	1.600	W	W
Ferry	3,247	W	4,350	3.821	4,296	6,014	5.567
Franklin	W	524	129	W	W	937	W

Appendix A- 10. Value of mineral production ($m) in interior counties 1952- 1979 (continued).

State/County	Value of Mineral Production by Year						
Garfield	138	115	51	39	88	337	293
Grant	3,682	W	W	W	W	W	7,818
Kittitas	272	W	W	W	W	W	W
Klickitat	299	710	248	292	W	340	3,739
Lincoln	90	539	175	W	318	472	981
Okanogan	W	112	302	321	679	W	W
Pend Orielle	7,207	10,166	14,009	17,914	13,886	W	13,125
Skamania	359	224	445	634	390	373	613
Spokane	3,532	3,911	W	W	W	W	W
Stevens	5,552	10,178	9,502	9,495	4,828	5,312	11,096
Walla Walla	W	W	W	W	950	728	552
Whitman	W	W	239	580	248		1,603
Yakima	1,449	W	W	W	W	W	W
State total	114,663	143,930	158,505	187,222	152,887	180,435	225,150
Wyoming	1952	1953	1954	1955	1956	1957	1958
Fremont	205	271	290	245	36,594	40,964	51,166
Lincoln	3,068	3,208	2,423	2,482	3,089	2,206	2,497
Sublette	5	65	10	54	1,018	1,271	1,650
Teton	223	51	127	126	119	121	35
State total	204,495	255,906	281,306	297,752	317,594	345,604	369,938
	1959	1960	1961	1962	1963	1964	1965
Fremont	49,812	58,568	57,498	58,002	69,612	73,497	67,800
Lincoln	W	W	4,273	3,944	5,671	8,992	8,104
Sublette	W	4,099	16,190	16,485	22,316	22,899	22,424
Teton	24	89	10,910	94,220	372	W	W
State total	391,621	438,733	466,247	485,777	504,633	500,256	498,552
	1966	1967	1968	1969	1970	1971	1972
Fremont	66,841	82,214	89,520	86,803	82,688	83,175	88,360

Appendix A-10. Value of mineral production ($m) in interior counties 1952-1979 (continued).

State/County	Value of Mineral Production by Year						
Lincoln	8,308	8,539	8,174	10,518	12,122	14,135	16,130
Sublette	21,401	20,670	20,702	24,565	22,047	24,581	25,217
Teton	344	W	281	W	W	209	W
State total	505,806	530,696	576,190	647,443	705,533	717,937	746,743
	1973	1974	1975	1976	1977*	1978	1979
Fremont	89,254	126,231	131,606	173,488	35,364	32,076	30,517
Lincoln	21,824	31,012	32,286	50,267	W	W	W
Sublette	24,327	33,008	36,386	39,322	W	W	W
Teton	W	W	W	W	W	W	W
State total	928,583	1,437,200	1,644,438	1,851,599	442,444	493,071	590,176

NA not applicable
W withheld to avoid disclosure of confidential information.
* prior to 1977 mineral fuels included.

Source: US Bureau of Mines

Appendix A-l 1. Estimated number of undiscovered deposits remaining by tract[1]

		Probability				
Target Terranes	Tract	90	50	10	5	1
Alkaline Au-Te	C01	1	6	11	12	20
	W100	0	0	1	2	4
Epithermal Vein, Comstock type	W101	1	2	3	4	8
	W102	2	3	4	6	8
	W02	1	2	4	5	8
	PC101	1	3	4	4	4
	PW100	0	1	3	5	5
	C102	0	0	1	4	5
Epithermal Vein. Quartz-Adularia type	C13	1	3	5	6	9
Hot-Spring Au-Ag	C05	1	3	5	6	9
	W107	1	2	4	11	24
	W108	6	12	18	24	30
	W109	0	1	3	5	5
	W112	0	0	2	3	4
	W129	0	2	5	7	8
	PW101	0	1	3	5	7
	C19	0	2	3	4	5
Massive Sulfide, Kuroko type	C06	0	0	0	0	1
	W96	1	3	6	6	8
	W113	0	0	0	0	1
Sedimentary Exhaltive Zn-Pb	W16	0	0	1	2	3
	C14	0	2	4	6	8
	W07	0	0	1	2	4
Sediment-Hosted Au	W06	0	0	0	0	1
	W127	0	0	0	0	1

[1] The number of deposits under each probability value refers to the exceedance level, i.e., there is a 50% chance that at least 6 deposits remain in tract C01 (of the Alkaline Gold-Telluride type terrane. The tract is indicated to be "favorable."

Appendix A-l 1. Estimated number of undiscovered deposits remaining by tract (continued).

		Probability				
Target Terranes	Tract	90	50	10	5	1
Sediment-Hosted Cu, Revett type	W13	9	10	15	20	30
Sediment-Hosted Cu, Reduced Facies type	W14	0	0	1	3	5
Skarn Au	C02	3	12	20	28	36
	W128	0	1	3	5	7
	W137	0	0	0	0	1
	W136	0	0	0	0	1
Non-target Terranes	Tract	90	50	10	5	1
Massive Sulfide, Besshi type	PC18	0	0	0	0	1
	W142	0	0	0	0	1
Massive Sulfide. Cyprus type	PC15a	0	1	2	2	3
	W132	0	0	0	0	1
Epithermal Vein, Sado type	PC100	0	2	5	8	8
Epithermal Vein. Quartz- Alunite type	PC08	0	1	2	2	2
	C12	0	0	0	0	1
Homestake Stratiform Au	C04	0	2	4	5	6
Massive Sulfide, Sierran Kuroko type	PC15	0	2	4	7	12
	PC16	0	0	1	2	2
Low-Sulfide Au-Quartz Vein	PC20	0	0	0	0	1
	PC21	0	0	0	0	1
	W114	0	0	0	0	1
	W115	0	0	1	3	8
	W135	0	0	2	4	7
Mississippi Valley, minor	W08	0	1	1	2	2
Porphyry Cu	PC34	0	0	0	0	1
Porphyry Cu, No. America	C09	1	4	6	7	9
	W119	0	0	0	0	1
	W119a	0	0	0	0	1

Appendix A- 11. Estimated number of undiscovered deposits remaining by tract (continued).

		Probability				
Target Terranes	Tract	90	50	10	5	1
	C100	0	1	3	6	7
Porphyry Cu, BC/AK type	W11	0	0	1	2	5
	PC26	3	8	15	15	15
	W118	0	0	2	3	4
	PC27	1	3	10	10	10
Polymetallic Replacement	C07	1	4	6	8	12
	W120	0	0	0	0	1
Skarn Cu	W122	0	0	0	0	1
	W123	0	3	5	9	12
	W124	0	0	0	0	1
	PC05	0	0	0	0	1
Skarn Zn-Pb	C15	0	0	2	4	6
	W125	0	0	0	0	1
Porphyry Mo, Low F	C105	0	0	0	0	1
	W138	0	2	7	8	10
	W139	0	0	1	3	5
	W140	0	0	0	0	1
	W143	0	0	0	0	1
	PC102	0	0	0	0	1
	PC103	0	0	0	0	1

Appendix B-l. Bibliography of USGS Deposit Models

Alkaline Au-Te:

Bliss, J.D., Sutphin, D.M., Mosier, D.L., and Allen, M.S., 1992, Grade-tonnage and target-area models of Au-Ag-Te veins associated with alkaline rocks: U.S. Geological Survey Open-File Report 92-208, 15 p.

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Massive sulfide, Cyprus type:

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Massive sulfide, Kuroko type:

Singer, D.A. and Mosier, D.L., 1986, Grade and tonnage model of kuroko deposits, ***in*** Cox, D.P., and Singer, D.A, eds., Mineral deposit models: U.S. Geological Survey Bulletin 1693, p. 190-197.

Massive sulfide, Sierran Kuroko type:

Singer, D.A., 1992, Grade and" tonnage model of Sierran kuroko deposits, ***in*** Bliss, J.D., ed., Developments in mineral deposit modeling: U.S. Geological Survey Bulletin 2004, p. 29-32.

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Mosier, D.L., and Briskey, J.A., 1986, Grade and tonnage model of southeast Missouri Pb-Zn and Appalachian Zn deposits, ***in*** Cox, D.P., and Singer, D.A., eds., Mineral deposit models: U.S. Geological Survey Bulletin 1693, p. 224-226. . The grade-tonnage distribution used for the ICBEMP simulation is the only that part of the distribution that lies below the median tonnage of the general model.

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Menzie, W.D., and Singer, D.A., 1993, Grade and tonnage model of porphyry Cu deposits in British Columbia, Canada, and Alaska, USA: U.S. Geological Survey Open-File Report 93-275, 8 p.

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