



United States Government Accountability Office
Report to the Chairman, Committee on
Natural Resources, House of
Representatives

June 2021

HARDROCK MINING MANAGEMENT

Selected Countries,
U.S. States, and
Tribes Have Different
Governance
Structures but
Primarily Use Leasing

GAO@100 Highlights

Highlights of [GAO-21-298](#), a report to the Chairman, Committee on Natural Resources, House of Representatives

Why GAO Did This Study

Hardrock minerals such as gold, silver, and copper play a significant role in U.S. and global economies—in 2018, hardrock minerals extracted worldwide were valued at about \$981 billion. However, extracting these minerals creates the potential for public health, safety, and environmental hazards. Different approaches exist to manage these hazards and hardrock mining.

GAO recently reported on the number and characteristics of mining operations on federal lands in [GAO-20-461R](#) and was also asked to review the methods different governments use to manage mining. This report describes the governance structures and approaches used to manage mining on (1) selected mineral-producing countries' land, (2) state-owned land in selected U.S. states, and (3) tribal lands subject to federal laws and regulations.

GAO reviewed laws, regulations, government documents, legal guides, and nongovernmental and industry reports. GAO also interviewed nongovernmental and mining association representatives and officials from selected states and countries. GAO selected countries that were top mineral producers, perceived by researchers to have good mining governance, and were attractive to mining investors. GAO selected states in the western region of the U.S. that produced the highest value of hardrock minerals compared with other U.S. regions. GAO examined federal laws and regulations that generally govern mining on tribal land and interviewed one tribe on mining approaches used.

View [GAO-21-298](#). For more information, contact Mark E. Gaffigan at (202) 512-3841 or gaffiganm@gao.gov.

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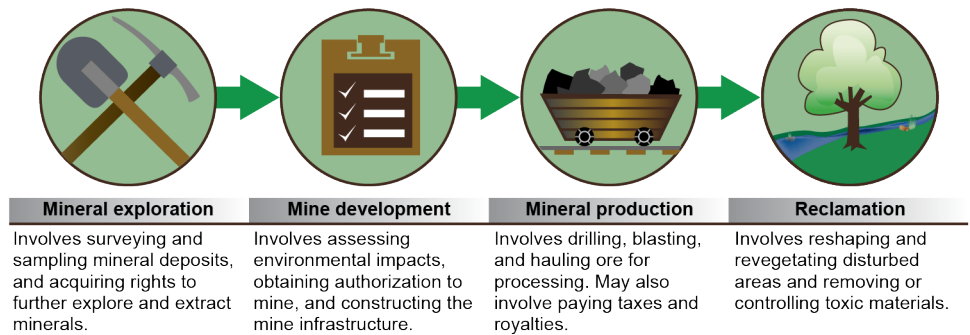
HARDROCK MINING MANAGEMENT

Selected Countries, U.S. States, and Tribes Have Different Governance Structures but Primarily Use Leasing

What GAO Found

Australia, Canada, and Chile—three top mineral-producing countries as of 2018—generally own the minerals on private and government lands and manage hardrock mining at the national or regional (state, provincial, or territorial) government levels. Australia and Canada use national and regional governments to manage mining, whereas Chile uses national governance structures. All three countries primarily use leasing to manage mining. However, some Canadian provinces allow mineral exploration using a location system that provides open access to land to stake a mining claim. Australia, Canada, and Chile collect royalties and corporate income taxes on mineral extraction; however, the types and rates vary. For example, Canada and Chile's royalties are based on operators' net proceeds, while some Australian regional governments' royalties are also based on net market value.

Primary Stages of Hardrock Mining



Source: GAO analysis. | GAO-21-298

In 11 western states—Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming—responsibility for managing mining on state-owned lands, including trust lands, is decentralized among multiple governance structures. These states primarily use leasing, although Alaska also allows operators to stake mine claims on certain lands, according to state officials. All states collect royalties, or taxes that are similar to royalties, on mining. The types and rates vary, but states typically base their rates on quantity or weight, gross revenue, net smelter returns (based on the value of minerals extracted, with deductions for processing), or net proceeds.

Hardrock mining on trust and restricted fee lands (tribal lands) is managed by governance structures at the tribal and federal government levels, in accordance with the approaches established in tribal and federal law. Tribes decide whether to allow hardrock mining on their lands. If so, multiple governance structures at the tribal level may be involved in managing the mining, depending on the requirements of tribal law, which may vary by tribe. In addition, governance structures at the federal level are involved in managing mining. Two federal laws—the Indian Mineral Development Act of 1982 and the Indian Mineral Leasing Act—require the use of minerals agreements, as defined in regulation, or leases, respectively. However, few tribes allow hardrock mining on their lands, according to the Department of the Interior.

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Abbreviations

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CDRMS	Colorado Division of Reclamation, Mining and Safety
Interior	U.S. Department of the Interior
MDEQ	Montana Department of Environmental Quality
MDNRC	Montana Department of Natural Resources and Conservation
MEPA	Montana Environmental Policy Act
ONRR	Office of Natural Resources Revenue
SERNAGEOMIN	Servicio Nacional de Geología y Minería (National Service of Geology and Mining of the Government of the Republic of Chile)
SITLA	School and Institutional Trust Lands Administration
SMCRA	Surface Mining Control and Reclamation Act
USGS	United States Geological Survey

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June 30, 2021

The Honorable Raúl Grijalva
Chairman
Committee on Natural Resources
House of Representatives

Dear Mr. Chairman:

Hardrock minerals such as gold, silver, and copper play a significant role in U.S. and global economies, but extracting these minerals disturbs land and creates the potential for serious public health, safety, and environmental hazards.¹ For example, acidic water draining from waste rock can carry heavy metals, such as arsenic, into nearby streams, damaging communities' water sources. To manage hardrock mining on their lands and mitigate the hazards, the U.S., including states and tribes, as well as other countries, use governance structures such as agencies, courts, and commissions. These governance structures use various approaches to determine steps operators must take to explore for minerals; develop new mines; produce minerals (as well as pay taxes and royalties, depending on the type of approach); and remove mine structures and restore disturbed lands—a process known as reclamation.² In the U.S. and other countries, the way hardrock mining is managed may differ among regional governments, including states, or on lands belonging to tribes or other indigenous peoples.

¹For the purposes of this report, we use the term “hardrock minerals” as a synonym for nonfuel or nonenergy minerals, which is a term more commonly used by other countries, U.S. states, and Indian tribes. For hardrock minerals, we include precious metals (such as gold, platinum, and silver), nonferrous metals (such as aluminum, copper, and lead), gemstones, and some varieties of clay and stone. We did not review approaches used to manage coal, oil, gas, and uncommon varieties of sand and gravel.

²For this report, we refer to mining companies, individual miners, leaseholders, and claimholders as “operators.”

We recently reported on mining on federal lands, and you asked us to review how various other governments manage hardrock mining.³ This report describes the governance structures and approaches used to manage hardrock mining on (1) lands in selected mineral-producing countries, (2) state-owned lands in selected U.S. states, and (3) tribal lands subject to federal laws and regulations.

To address all three objectives, we reviewed government documents and websites that described governance structures and approaches used to manage hardrock mining. In addition, to help identify noteworthy features of selected jurisdictions' governance structures and approaches, we collected information from the American Exploration and Mining Association and the National Mining Association, and interviewed individuals knowledgeable about hardrock mining law and economics.⁴

To address the first objective and select the mineral-producing countries to include in our review, we reviewed the

- World Mining Congress' *World Mining Data 2019* to identify the value of minerals that countries produced; and
- Natural Resource Governance Institute's *Resource Governance Index* and Fraser Institute's *Annual Survey of Mining Companies 2019* to determine which countries were the most attractive to mining investors and perceived by researchers to have good mining governance—that is, policies and practices to ensure both

³In May 2020, we issued a report on the number of authorized mining operations on federal lands, as well as the royalties obtained from, and the quantity of solid minerals produced on, federal lands for fiscal year 2018. See GAO, *Mining on Federal Lands: More than 800 Operations Authorized to Mine and Total Mineral Production is Unknown*, [GAO-20-461R](#) (Washington, D.C.: May 28, 2020). We also have ongoing work examining hardrock mining systems on federal lands and stakeholder views of the systems. App. I has background information on U.S. federal mining systems.

⁴The American Exploration and Mining Association is a national association representing the minerals industry, with members across North America and the world. The National Mining Association is a national trade organization that represents the mining industry's interests before various entities, such as Congress, federal agencies, and the media.

environmental protection and the public benefits from mining on public lands.⁵

We also interviewed representatives from the Natural Resource Governance Institute and the Fraser Institute regarding the governance structures of mineral-producing countries and the approaches countries use to manage mining.⁶ From our review of these sources and interviews, we selected Australia, Canada, and Chile, which are top mineral-producing countries, perceived to have good mining governance, and attractive to investors.⁷ We believe, based on our review, that the World Mining Congress' data were sufficiently reliable for selecting countries to include in this report.

For these three countries, we reviewed aspects of their hardrock mining laws and regulatory documents and contacted government officials and other knowledgeable parties. Specifically, to obtain further clarification, we interviewed officials from Natural Resources Canada (a department within the Canadian national government) and Chile's Servicio Nacional de Geología y Minería (National Service of Geology and Mining) and Ministerio de Minería (Ministry of Mining). In addition, we collected government documents and mining information from Australian officials with the Department of Industry, Science, Energy and Resources, as well as Geoscience Australia.⁸ During our interviews and contact with country officials, we collected clarifying information on the approaches these three countries use to manage mining, as well as any features of their approaches that officials viewed as unique and important. Additionally, we

⁵International Organizing Committee for the World Mining Congresses, *World Mining Data 2020*, Vol. 34 (Vienna, Austria: Federal Ministry for Sustainability and Tourism, Republic of Austria: April 2019); Natural Resource Governance Institute, *2017 Resource Governance Index* (New York, NY: 2017); Ashley Stedman, Jairo Yunis, and Elmira Aliakbari, *Fraser Institute Annual Survey of Mining Companies 2019* (Vancouver and British Columbia, Canada: 2020).

⁶The Natural Resource Governance Institute is an independent nongovernmental organization that provides natural resource policy advice and advocacy based on research. The Fraser Institute is an independent, nonpartisan research and educational organization that studies issues such as government policy effects.

⁷In 2018, Australia, Canada, and Chile produced hardrock minerals worth approximately \$82 billion, \$38 billion, and \$46 billion, respectively. International Organizing Committee, *World Mining Data 2020*, Vol. 34, pp.44, 47.

⁸In response to Australian government officials' preference, we communicated with them via email rather than through interviews when gathering information on Australia's management of hardrock mining.

interviewed associations and individuals knowledgeable about hardrock mining, including the National Mining Association; the American Exploration and Mining Association; and others knowledgeable about mining law, mining economics, and geochemistry. Furthermore, we incorporated technical comments and corrections in the draft and in appendix III, as appropriate, from government officials in these three countries. Our report provides a description of governance structures and approaches for managing hardrock mining on land governed by the countries we selected for review but is not generalizable to countries other than those described.

To address the second objective and select states to include in our review, we reviewed data from the U.S. Geological Survey's (USGS) report on mineral commodities in 2019, which discusses the total value of minerals that states produce.⁹ This USGS report divided the U.S. into four regions, with one of these regions comprising western states, including Alaska and Hawaii. This region produced the highest value of minerals in the U.S. in 2018.¹⁰ According to our review, we believe these data were sufficiently reliable for selecting states to include in this report. In addition, we reviewed related GAO reports, including our 1993 report entitled *Mineral Royalties: Royalties in the Western States and in Major Mineral-Producing Countries*, which discussed top mineral-producing western

⁹U.S. Department of the Interior, U.S. Geological Survey, *Mineral Commodity Summaries 2019* (Reston, VA: Feb. 28, 2019), 14-18. These were the most recent data available at the time we conducted our audit work. These data were not separated by land ownership type, such federal, private, state, or trust lands.

¹⁰The western region included Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, which produced approximately 41 percent of the hardrock minerals in the U.S. in 2018. The southern region included Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia, which produced approximately 27 percent of hardrock minerals. The midwestern region included Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin, which produced approximately 22 percent of hardrock minerals. The northeastern region included Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont, which produced approximately 6 percent of hardrock minerals. The remaining percentage includes values withheld to avoid disclosing company proprietary data.

states and informed our state selection.¹¹ From our review of USGS data and mineral-producing states that were previously identified in GAO reports, we selected 11 states that were in the highest mineral-value-producing region in 2018—Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming—collectively producing approximately \$26 billion worth of minerals from federal, state, and private lands.¹²

For these 11 western states, we reviewed 2018 data—the most recent available at the time of our review—from the USGS’ Gap Analysis Project, 2018, Protected Areas Database of the U.S. and the U.S. Census Bureau to identify the location of state-owned lands, including trust lands.¹³ We reviewed state mining laws and regulations and collected information on the states’ governance structures and mining approaches from state trust land management and mining oversight agency websites. We obtained and reviewed additional documents containing information on governance structures and mining approaches from state agencies that manage trust lands and hardrock mining on those lands in the 11 states we selected.

To obtain further clarification, we contacted officials from Arizona’s State Land Department; California’s State Lands Commission; Idaho’s Department of Lands; Montana’s Department of Natural Resources and Conservation, as well as the state’s Department of Environmental Quality; New Mexico’s State Land Office; Oregon’s Department of Geology and Mineral Industries, as well as Oregon’s Department of State Lands; Utah’s Department of Natural Resources; the Washington State Department of Natural Resources; and Wyoming’s Department of Environmental Quality, as well as Wyoming’s Office of State Lands and Investments. We also interviewed officials from Alaska’s Department of

¹¹GAO, *Mineral Royalties: Royalties in the Western States and in Major Mineral-Producing Countries*, [GAO/RCED-93-109](#) (Washington, D.C.: Mar. 29, 1993); *Hardrock Mining: Updated Information on State Royalties and Taxes*, [B-330854](#) (Washington, D.C.: July 16, 2019); and *Hardrock Mining: Information on State Royalties and Trends in Mineral Imports and Exports*, [GAO-08-849R](#) (Washington, D.C.: July 21, 2008).

¹²We excluded two states in the highest-producing region, which was defined by USGS, from our analysis: Nevada and Hawaii. Nevada owns a small percentage of land—about 185,000 acres—and does not allow mining on its lands. In addition, Hawaii had a small amount of hardrock mining on its state-owned lands—0.17 percent—in 2018 and was not included in related GAO reports.

¹³These data did not separate state-owned lands by type, such as trust lands and state parks.

Natural Resources; Colorado's State Land Board and Division of Reclamation, Mining and Safety; and Utah's School of Institutional Trust Lands Administration.

Additionally, we interviewed mining association representatives from the Interstate Mining Compact Commission, National Association of State Trust Lands, National Mining Association, and American Exploration and Mining Association regarding their experiences with these 11 states' mining approaches. Furthermore, we incorporated technical comments and corrections in the draft and in appendix IV, as necessary, from government officials in these 11 states. Our report provides a description of governance structures and approaches for managing hardrock mining on state-owned lands—primarily trust lands—that we selected for review, but it is not generalizable to states other than those described.

For the third objective, we reviewed federal laws that generally govern mining on tribal lands—tribal trust and restricted fee land¹⁴—the Indian Mineral Leasing Act¹⁵ and the Indian Mineral Development Act of 1982.¹⁶ For each of these laws, we obtained and analyzed the implementing regulations. We focused on describing the overall approaches established

¹⁴We refer to tribal trust and restricted fee lands as “tribal lands” in this report. The federal government holds the legal title to lands held in trust for tribes (tribal trust lands), but the Indian tribes retain the benefits of land ownership. Indian tribes hold title to tribal restricted fee lands, but there are legal restrictions against alienation or encumbrance of the land (the land cannot be sold, leased, or conveyed without the approval of the Secretary of the Interior). For purposes of this report, the term “tribal lands” includes the subsurface mineral estate.

¹⁵Act of May 11, 1938, 52 Stat. 347-48 (codified as amended at 25 U.S.C. §§ 396a-396g). The Indian Mineral Development Act of 1982, as amended, does not apply to leases for certain tribes, such as leases on the Osage Reservation. See 25 U.S.C. § 396f.

¹⁶Pub. L. No. 97-382, 96 Stat. 1938 (codified at 25 U.S.C. §§ 2101-2108). In addition, under the Indian Tribal Energy Development and Self-Determination Act of 2005 as amended, tribes may enter into Tribal Energy Resource Agreements with the Department of the Interior or leases or business agreements for development of energy resources with certified tribal energy development organizations. Upon the Secretary of the Interior's approval of a Tribal Energy Resource Agreement, a tribe can then enter into a lease or business agreement for development of energy resources without further review and the approval of the Secretary. Upon the Secretary of the Interior's certification of a tribal energy development organization, tribes can enter into a lease or business agreement with such an organization for development of energy resources without further review and the approval of the Secretary. We excluded Tribal Energy Resource Agreements and leases or business agreements with certified tribal energy development organizations from our review because, as of July 2020, no Indian tribes had entered into such an agreement, and no tribal energy development organizations had been certified.

in federal laws and regulations to manage hardrock mining on tribal lands. Federally recognized tribes have a government-to-government relationship with the U.S. Tribes retain inherent sovereignty to the extent that it has not been abrogated by treaty, statute, or their dependent status, according to relevant case law; to the extent they retain such inherent sovereignty, tribes are able to enact laws, including governing hardrock mining, on their lands. We did not review individual tribal laws or regulations, which may impose additional requirements on hardrock mining on tribal lands.¹⁷ In addition, hardrock mining on lands held in trust for individual Indians or owned in restricted fee status is also subject to federal law and regulation, but we did not review the hardrock mining approaches established in those laws and regulations governing lands held in trust or owned in restricted fee status.

We interviewed officials from the Bureau of Indian Affairs (BIA) Division of Energy and Mineral Development within the Department of the Interior (Interior) and from Interior's Office of Natural Resources Revenue (ONRR) to obtain information on whether and where hardrock mining has occurred on tribal lands and any role these agencies have in managing hardrock mining on tribal lands.¹⁸ Additionally, we interviewed officials from the Tohono O'odham Nation of Arizona about approaches used to manage hardrock mining on the tribe's land.¹⁹ Furthermore, we interviewed and collected information from individuals knowledgeable about hardrock mining on tribal lands, including the Tohono O'odham Nation of Arizona and lawyers who have worked with tribes and specialize in mining law.

We conducted this performance audit from October 2019 to June 2021 in accordance with generally accepted government auditing standards.

¹⁷Federally recognized tribes and their members are eligible for the special programs and services provided by the federal government to Indians. In the *Federal Register*, the Secretary of the Interior annually publishes a list of all tribal entities that the Secretary recognizes as tribes. As of March 2021, there were 574 federally recognized tribes. See 86 Fed. Reg. 7554 (Jan. 29, 2021).

¹⁸The Division of Energy and Mineral Development provides technical, economic advice, and services to American Indian mineral owners when developing their energy and mineral resources. ONRR manages and ensures full payment of revenues owed for the development of the U.S.'s energy and natural resources on the outer continental shelf and onshore federal and American Indian lands.

¹⁹According to ONRR data, two tribes with inactive mines on their lands—the Tohono O'odham Nation of Arizona and the Pueblo of Zia, New Mexico—were receiving rental and royalty payments in 2018. Pueblo of Zia, New Mexico, did not respond to our request for an interview or information.

Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Uses and Economic Value of Hardrock Minerals

Hardrock minerals are widely used in smart phones, computers, automobiles, renewable energy infrastructure, and defense technologies. For example, 31 metals—including hardrock minerals—are needed to construct a personal computer, according to the USGS. In addition, the U.S. military uses 750,000 tons of minerals annually to construct weapons, jet engines, aircraft, and body armor, according to a National Mining Association initiative.²⁰

Hardrock minerals extracted worldwide were valued at approximately \$981 billion in 2018.²¹ Australia, Canada, and Chile were among the top mineral-producing countries in 2018, with their total hardrock mineral production valued at \$82 billion, \$38 billion, and \$46 billion, respectively.²² Within the U.S., minerals worth a total of approximately \$26 billion were produced from federal, state, and private lands in Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming in 2018—states located in the region that produced the highest value of hardrock minerals.²³

Hardrock mineral resources in the U.S. have also been extracted from tribal lands, but no tribes produced minerals in 2018, according to ONRR

²⁰Minerals Make Life, “U.S National Defense: Stronger with Minerals” (Washington, D.C.: National Mining Association: Aug. 14, 2017), accessed March 3, 2021, <https://mineralsmakelife.org/resources/u-s-national-defense-stronger-minerals/>.

²¹This value is based on the most recent data available at the time of our review. International Organizing Committee for the World Mining Congresses, *World Mining Data 2020*, Vol. 35 (Vienna, Austria: Federal Ministry of Agriculture, Regions and Tourism, Republic of Austria: May 2020).

²²These values are based on the most recent data available at the time of our review. International Organizing Committee for the World Mining Congresses, *World Mining Data 2020*, 48.

²³The U.S produced approximately \$79 billion worth of hardrock minerals in 2018, according to the USGS. U.S. Geological Survey, *Mineral Commodity Summaries 2019*. Total production includes hardrock minerals produced on federal, state, and private lands.

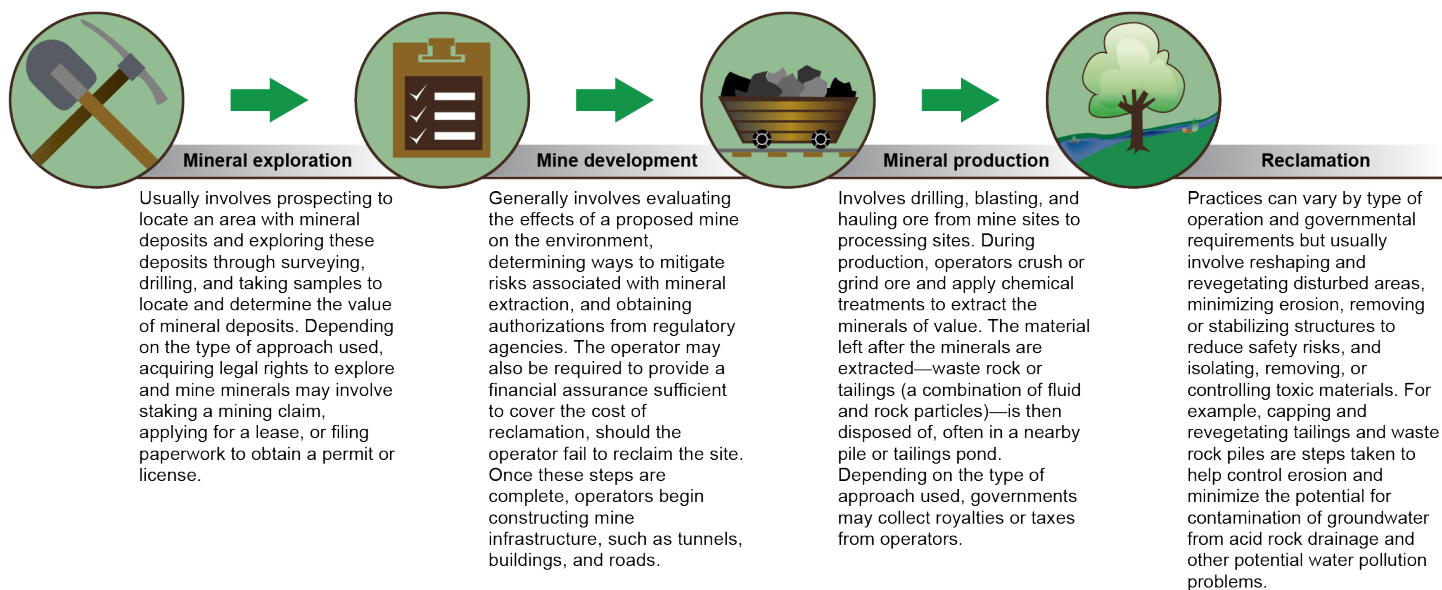
data.²⁴ However, ONRR data indicated that the Tohono O’odham Nation of Arizona’s Mission Complex Mine produced approximately \$1.5 million in copper in 2007—the most recent year of significant production.

Stages of Hardrock Mining

Hardrock mining operations generally follow four stages: mineral exploration, mine development, mineral production, and reclamation (see fig. 1). Some of these stages can take place simultaneously, depending on the characteristics of the operation.²⁵ A detailed discussion of selected countries and states’ approaches to managing these four stages can be found in appendixes III and IV.

Figure 1: Primary Stages of Hardrock Mining

Governments have developed different approaches to manage mineral exploration, mine development, mineral production, and reclamation.



Source: GAO analysis. | GAO-21-298

Two common approaches governments use to manage these four stages of hardrock mining include

²⁴ONRR officials said minerals have been extracted from individual American Indian lands as well, but we did not review mining on individual American Indian lands for this report.

²⁵For more information on these four stages, see GAO, *Hardrock Mining: BLM and Forest Service Have Taken Some Actions to Expedite the Mine Plan Review Process but Could Do More*, [GAO-16-165](#) (Washington, D.C.: Jan. 21, 2016).

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- the location system, which generally involves open access to lands for exploration, extraction, and development of minerals, typically without having to pay a royalty;²⁶ and
 - the leasing system, which generally involves a government maintaining title to the land while establishing conditions for use of the land in the provisions of the lease, such as the duration of use and royalty terms. Operators generally need to obtain government approval to mine in the form of a lease, or an agreement that functions similar to a lease, from the appropriate government to explore for minerals or develop a mine.

Mining Law and State-Owned Lands in the United States

State law governs mineral disposition on state-owned lands, consistent with the U.S. Constitution, the states' enabling acts, and federal laws.²⁷ Additionally, federal environmental laws, such as the Clean Water Act and Clean Air Act, guide states' laws for environmental protection of state trust lands.²⁸

The 11 western states we reviewed allow mining on state-owned lands, such as on trust lands. The federal government granted these trust lands to states to generate revenue for beneficiaries, such as public schools, universities, and mental health institutions. For example, Oregon's beneficiaries include public schools and Montana's include public schools, libraries, and state charitable institutions. Both federal and state laws designate the beneficiaries in the 11 western states included in our review—Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming. State trust lands

²⁶A royalty is a share of the product or profit from real property, reserved by the grantor of a mineral lease, in exchange for the lessee's right to mine or drill on the land. Bryan A. Garner, ed., *Black's Law Dictionary, Royalty* 11th ed. (Thomson Reuters: 2019). As we previously reported, out of the 872 mine operations authorized to produce hardrock minerals on federal lands as of September 30, 2018, 83 percent (728) of the mine operations were managed using the location system; the remaining 17 percent (144) of operations were managed using the leasing system. [GAO-20-461R](#), 4. See app. I for more information.

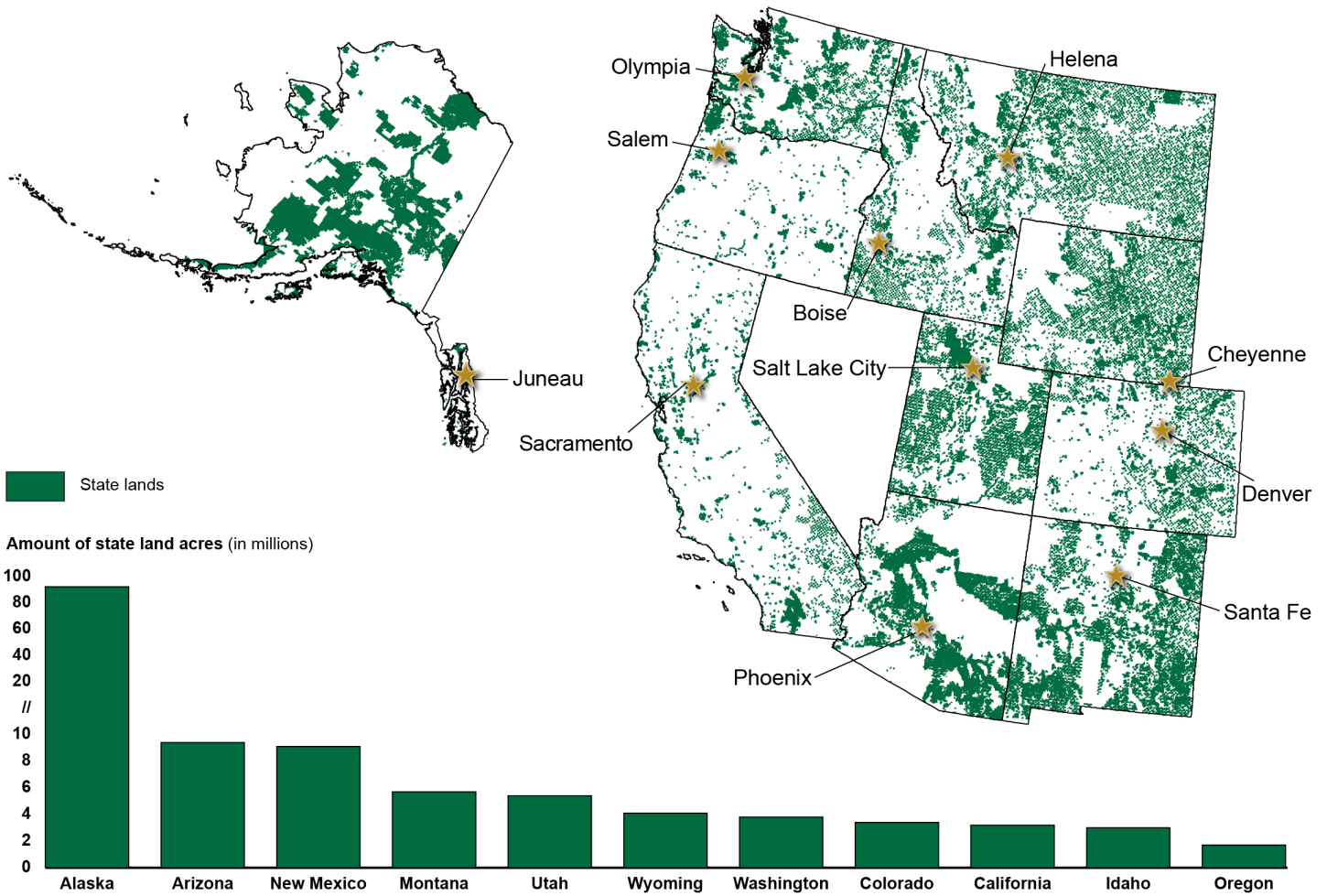
²⁷Dallin W. Jensen, "Administering State Lands—What Is the State's Trust Responsibility?" Proceedings of the 35th Annual Rocky Mountain Mineral Law Foundation Westminster, CO: 1989, INST 3, § 3.06.

²⁸See the Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, § 2, 86 Stat. 816 (codified as amended at 33 U.S.C. §§ 1251-1387) (commonly referred to as the Clean Water Act); Clean Air Act Amendments of 1977, Pub. L. No. 95-95, 91 Stat. 685 (codified as amended at 42 U.S.C. §§ 7401-7671q).

comprise approximately 46 million acres of land across 23 states, primarily in the western part of the U.S. (see fig. 2).²⁹

Figure 2: State-Owned Lands, Including Trust Lands, in the Western United States

The 11 western states we reviewed allow mining on state-owned lands, such as on trust lands granted from the federal government.



Sources: U.S. Geological Survey Gap Analysis Project, 2018, Protected Areas Database of the United States; U.S. Geological Survey data release, <https://doi.org/10.5066/P955KPLE>, U.S. Census Bureau, and MapInfo. | GAO-21-298

Note: This figure includes different types of state lands, such as trust lands and state parks. Nevada sold or traded the majority of its state-owned lands; however, approximately 185,000 acres remain, as of 2018. Nevada does not allow mining on its remaining state-owned lands. This map is not to scale.

²⁹Peter W. Culp et al., *State Trust Lands in the West: Fiduciary Duty in a Changing Landscape*, updated. (Cambridge, MA: Lincoln Institute of Land Policy, 2015), 8.

State-owned lands, including trust lands, are often organized in a checkerboard pattern because of the process the federal government used to grant states land upon statehood. This process was based on the U.S. Public Land Survey System, which was created through the Northwest Ordinance of 1787.³⁰ This survey system divides land into townships, each comprising 36 square miles; each township is further divided into numbered square-mile (640-acre) sections. When granting parcels of land—trust lands—to most western states, the federal government granted certain numbered township sections and, in some instances, designated certain beneficiaries.³¹ (See figs. 3 and 4.)³²

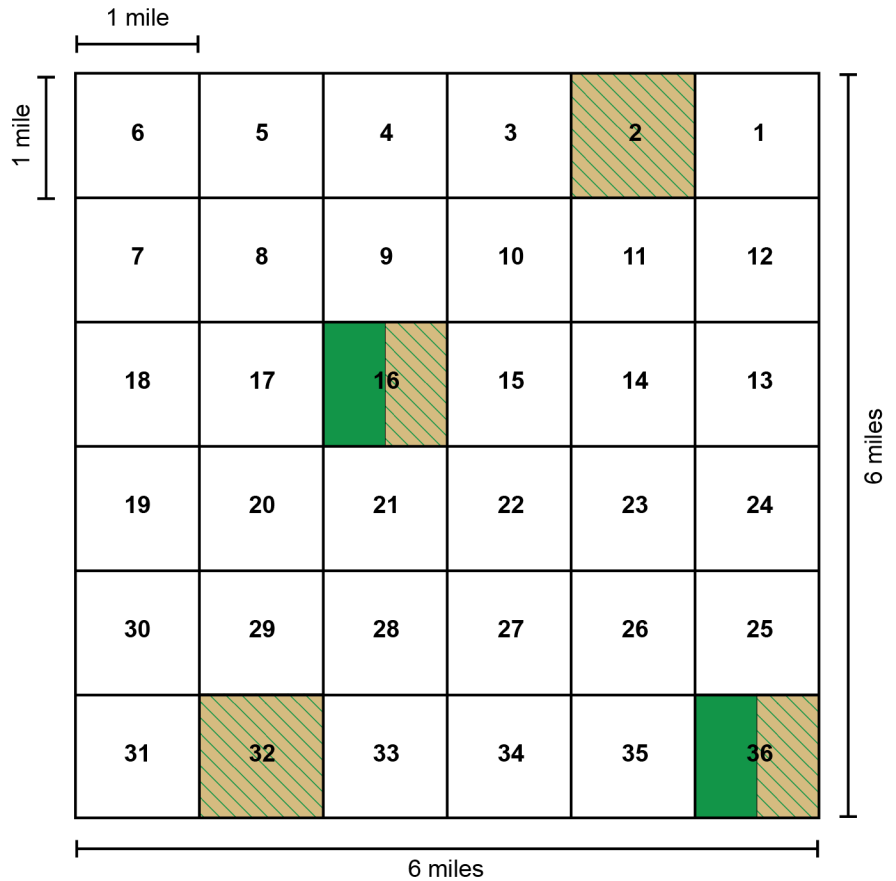
³⁰The Northwest Ordinance, officially titled “An Ordinance for the Government of the Territory of the United States North-West of the River Ohio,” was adopted by the Confederation Congress on July 13, 1787. Also known as the Ordinance of 1787, the Northwest Ordinance established a government for the Northwest Territory, outlined the process for admitting a new state to the Union, and guaranteed that newly created states would be equal to the original 13 states.

³¹However, the vast majority of Alaska’s lands are treated differently than other western states’ lands because when Alaska received its land grant, the federal government did not attach any special restrictions on revenue uses, according to a Lincoln Institute of Land Policy report. As a result, of the more than 110 million acres granted to the state, about 1.2 million acres were specifically dedicated for school purposes, with an additional 1 million acres dedicated to support mental health services. In addition, the state of California found that neither its enabling act nor its constitution impose trust responsibilities over township sections. Culp, *State Trust Lands in the West*, 11.

³²The practice of reserving section 16 of each township to provide funding for schools dates back to the republic’s earliest days. The General Land Ordinance of 1785 provided for the rectangular survey and sale of western lands, setting aside section 16 of each township “for the maintenance of public schools within the said township.” Congress established new states by passing enabling acts that set aside section 16 of each township, as well as some other sections, to support schools. See generally Jessica Wiles, “Montana’s State School Trust Lands,” vol. 38, no. 149, *Public Land & Resources Law Review* (Missoula, MT: 2017).

Figure 3: Township Sections Granted as Trust Lands to Western States

The federal government granted 10 of the 11 western states GAO reviewed (except Alaska) a combination of township sections as trust lands upon statehood, and revenue from activities on these lands benefits public institutions, such as schools.



California, Colorado, Idaho, Montana, Nevada, Oregon, Washington, and Wyoming received township sections 16 and 36.

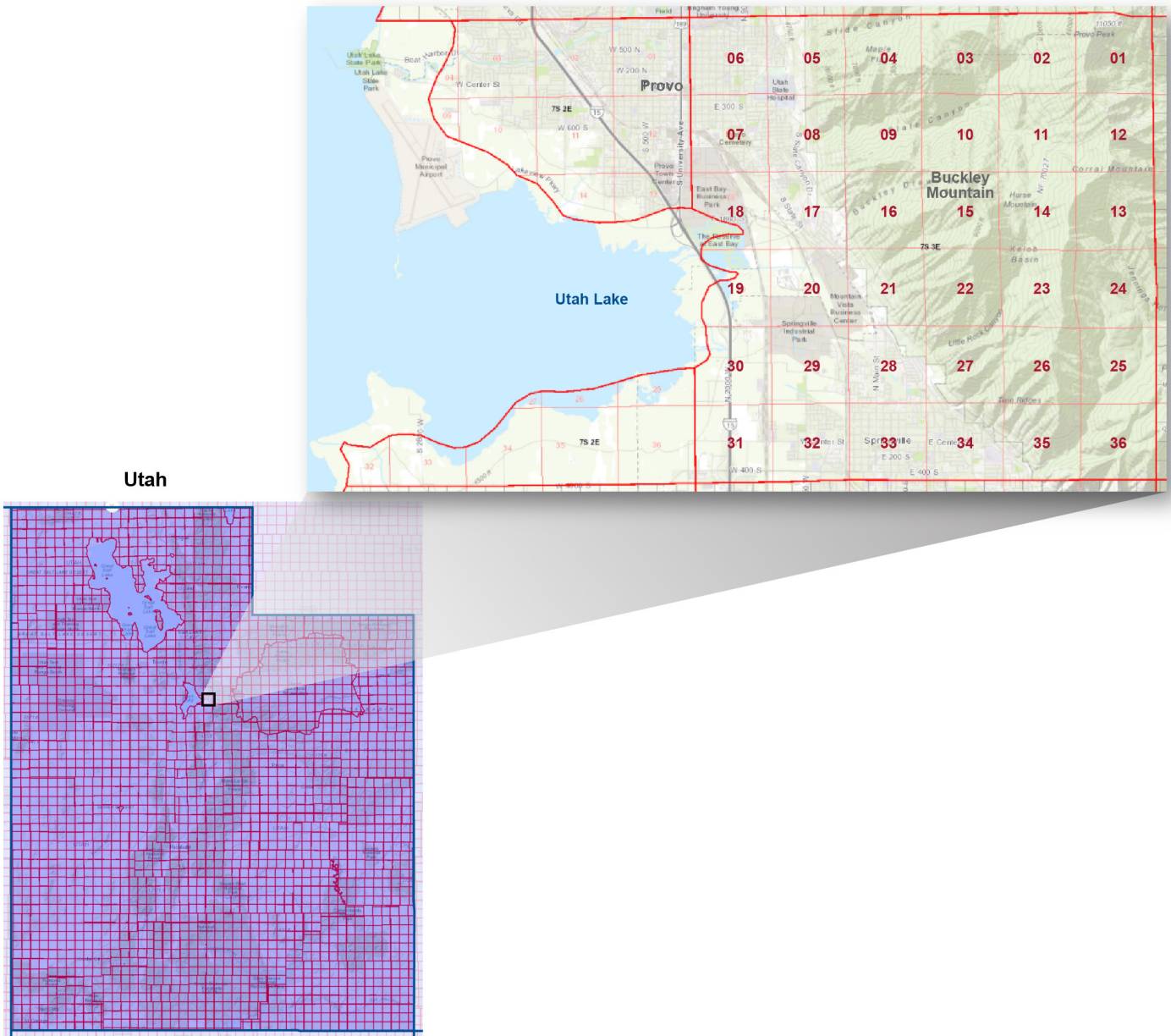
Arizona, New Mexico, and Utah received township sections 2, 16, 32, and 36.

Source: Lincoln Institute of Land Policy (Cambridge, MA). | GAO-21-298

Note: The Public Land Survey System divides most land in western states into townships of 36 square miles each, 6 miles on a side. Each township is divided into 36 numbered square-mile sections. The federal law granting Alaska statehood, although it did specify some uses of the land, did not stipulate specific township sections to be held in trust to benefit public institutions when Alaska received its land grant of more than 110 million acres from the U.S. government in 1959. We did not include Nevada in this report because it sold or traded the majority of its initial federal land grant of about 2.7 million acres, of which approximately 185,000 acres remain, and it does not allow mining on its state-owned lands.

Figure 4: Example of Townships and Township Sections in Utah

Utah has townships throughout the state, similar to other western states. Some errors were made when initially surveying the land in western states, but existing surveys are considered authoritative, and any new surveys must work from existing corners and surveys despite these errors, according to a Utah County government document. This sometimes results in township sections that are not square or contain acreage other than 640 acres.



Source: Department of the Interior, Bureau of Land Management General Land Office Records. | GAO-21-298

Mining Law and Tribal Lands

Tribes' inherent sovereignty predates the U.S., but treaties and federal law have limited tribes' sovereignty in certain circumstances, such as authorizing and regulating mining on tribal lands.³³ Tribes decide whether mining operators can extract minerals from tribal lands, and tribes can establish requirements for mining on their lands, but such mining is also subject to federal law. Two federal laws generally govern exploration and mining of hardrock minerals on tribal lands. The Indian Mineral Development Act of 1982 authorizes tribes, with the Secretary of the Interior's approval, to enter into a minerals agreement for exploration, extraction, or development of mineral resources on tribal lands.³⁴ The Indian Mineral Leasing Act authorizes certain tribes to lease tribal lands for mining purposes, with the approval of the Secretary of the Interior.³⁵ Some tribes are subject to other statutory and regulatory requirements for mining on tribal lands instead of the Indian Mineral Leasing Act.³⁶

Hardrock minerals are located below the surface of the land in what is known as the subsurface, or mineral estate. The owner of the subsurface mineral estate may be different from the owner of the surface estate and, similarly, the land status (e.g., restricted fee or trust) of the subsurface estate may differ from the status of the surface estate. According to Interior, it holds about 55 million surface acres and 57 million acres of subsurface minerals estates in trust for tribes (tribal trust land). The federal government holds legal title to tribal trust lands, but the tribes retain the benefits of land ownership. In addition, tribes may own land that is subject to restrictions on alienation or encumbrance—the land cannot

³³As of March 2021, the federal government recognized 574 tribes as distinct, independent political communities with certain powers of self-government, including power over their territory and members. Tribes can vary greatly in terms of their culture, language, population size, land base, location, and economic status.

³⁴Pub. L. No. 97-382, 96 Stat. 1938 (codified at 25 U.S.C. §§ 2101-2108). A minerals agreement is any joint venture, operating, production sharing, service, managerial, lease (other than a lease entered into pursuant to the Indian Minerals Leasing Act or the Act of March 3, 1909), contract, or other agreement providing for the exploration for, or extraction, processing, or other development of, minerals in which an Indian mineral owner owns a beneficial or restricted interest or providing for the sale or other disposition of the production or products of such minerals. 25 C.F.R. § 225.3.

³⁵Act of May 11, 1938, 52 Stat. 347-348 (codified as amended at 25 U.S.C. §§ 396a-396g).

³⁶For example, the Indian Mineral Leasing Act, as amended, does not apply to leases of certain tribes' land, such as the Osage Reservation. 25 U.S.C. § 396f. We did not review requirements for mining on tribal lands that are not subject to the Indian Mineral Development Act of 1982 or Indian Mineral Leasing Act.

be sold, leased, or conveyed without the Secretary of the Interior's approval—known as restricted fee land.

Australia, Canada, and Chile Manage Hardrock Mining at the National or Regional Government Levels, and All Three Countries Primarily Use Leasing

Australia, Canada, and Chile—three of the top mineral-producing countries in 2018³⁷—manage hardrock mining at the national or regional government levels, primarily using leasing.³⁸ Specifically, Australia and Canada manage hardrock mining primarily at the regional government level, whereas Chile uses national governance structures, including the courts. All three countries primarily use leasing, or agreements that are similar to a lease, to manage exploration for hardrock minerals and mine development, according to government mining documents and officials.³⁹ However, some Canadian provinces also allow mineral exploration using a location system. Appendix III provides additional information on the governance structures and approaches these three countries use to manage hardrock mining.

Australia and Canada Manage Hardrock Mining Primarily at the Regional Level, While Chile Manages Mining at the National Level

Australia manages hardrock mining primarily through regional governance structures. Australia consists of six states (New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) and two federal territories (Northern Territory and Australian Capital Territory). (See fig. 5.) Governing powers and responsibilities are divided among the federal, state, and territorial governments; collectively these governments are referred to as the Crown.⁴⁰ Australia's regional governments, specifically the states and territories, are responsible for developing mining policy, regulating mining, administering mineral exploration permits and mine development leases, and overseeing mine reclamation.

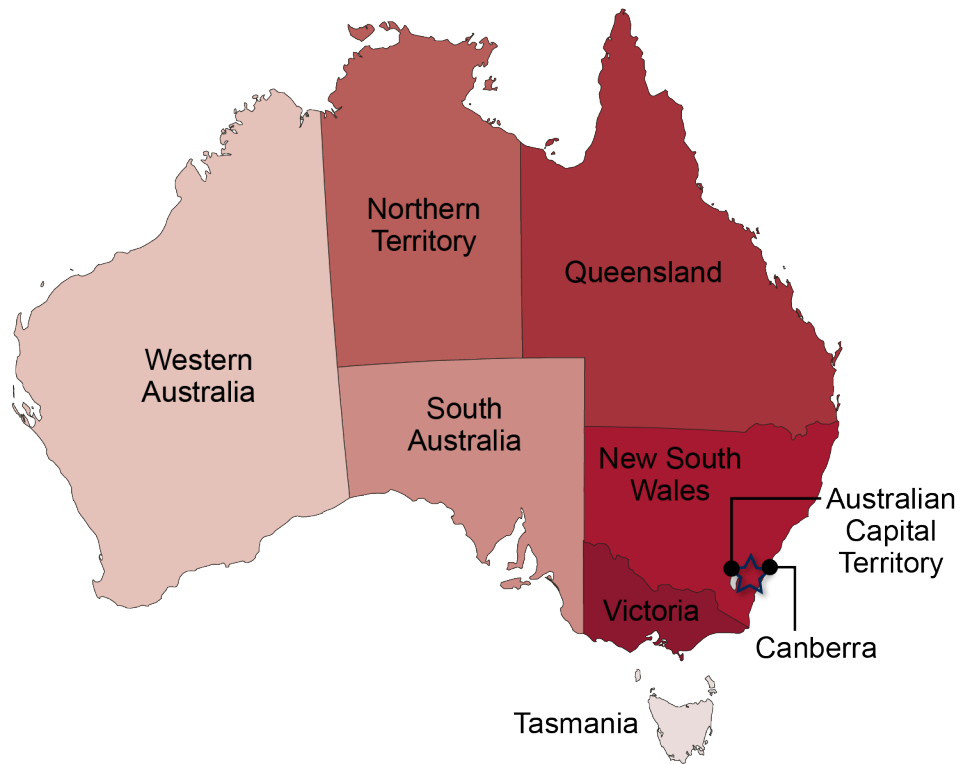
³⁷In 2018, Australia, Canada, and Chile extracted hardrock minerals valued at \$82 billion, \$38 billion, and \$46 billion, respectively. These amounts are based on the most recent data available at the time of our review. See International Organizing Committee for the World Mining Congress, *World Mining Data 2020*, Vol. 35.

³⁸For this report, regional government includes state, provincial, or territorial governments that are responsible for managing mining.

³⁹In general, under a lease, a government maintains title to the land and establishes terms for use of the land, including duration of use, land area limitations, and royalty terms. Countries may refer to mining agreements differently. Both Australia and Canada refer to them as licenses, permits, or leases, and Chile refers to them as concessions. For the purposes of this report, we refer to Australia, Canada, and Chile's mining agreements as "leases," unless otherwise noted.

⁴⁰The Crown in Australia generally owns minerals located under privately owned land.

Figure 5: Map of Australia's States and Territories



Source: Map Resources. | GAO-21-298

The regional governments in Canada manage hardrock mining. Canada is a federation of 10 provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, Quebec, and Saskatchewan) and three territories (Northwest Territories, Nunavut, and Yukon). (See fig. 6.) These governments have authority over Crown lands—lands owned by the federal or regional governments, according to a Canadian government mining official. In Canada, regional governments also manage the natural resources within their jurisdictions, with some exceptions.⁴¹ These governments regulate mineral exploration and mine development, oversee operational licensing and permitting, and monitor mines.

⁴¹The exceptions involve resources on federal land, in offshore waters, or on the continental shelf, which fall under federal jurisdiction, according to a Canadian official.

Figure 6: Map of Canada's Provinces and Territories



Source: Map Resources. | GAO-21-298

In both Australia and Canada, the federal government may become involved in some matters, such as those that have national environmental significance, according to government mining officials. In Australia, for example, actions that are likely to have a significant impact on a matter of national environmental significance, such as hardrock mining's effects on water resources, must be referred to the Commonwealth Minister for the Environment, according to an Australian mining official and website. This official also stated that the Minister then decides whether an assessment and regulatory approvals under the Environment Protection and Biodiversity Conservation Amendment Act are required. In Canada, the Impact Assessment Agency of Canada leads a national-level review of

Mineral Ownership in Australia, Canada, and Chile



In Australia, the federal (Commonwealth), state, and territorial governments (collectively known as the Crown) generally own minerals, according to Australian government websites. With some exceptions, Crown mineral resources located in the states and territories are owned by those states and territories rather than the Commonwealth.



In Canada, provincial and territorial governments own the natural resources, including land and mineral resources, according to Canadian officials.



In Chile, hardrock minerals are the national government's property, but the government can give mineral rights to operators, according to government mining officials.

Sources: GAO analysis of Australian documents, statements from Chilean and Canadian mining officials, U.S. Geological Survey, 2014 Minerals Yearbook Canada (Reston, VA: October 2017), and U.S. Department of State (graphics). | GAO-21-298

major resources projects—including hardrock mining projects—to foster sustainability.⁴²

Chile manages hardrock mining through national governance structures, including the national agencies and tribunal courts. The Ministry of Mining develops mining policy and principles, and the Chilean Copper Commission safeguards the government's interest in Chile's publicly owned mining company by reviewing and evaluating the company's operations. These two agencies, in combination with the legislature, are responsible for developing mining policy, according to Ministry of Mining officials. For example, in June 2020, the Chilean Ministry of Mining modified financial assurance requirements, according to Chilean government officials. The National Commission of Copper also advises the Chilean government on matters concerning the production of copper and other minerals. (See fig. 7.)

⁴²The Impact Assessment Act created the Impact Assessment Agency of Canada in 2019, according to a Canadian document.

Figure 7: Map of Chile



Source: Map Resources. | GAO-21-298

Tribunal courts at the national level are responsible for granting mineral exploration and mine development leases, as mandated under Chile's constitution, according to a senior Chilean official from the National Service of Geology and Mining of the Government of the Republic of Chile (SERNAGEOMIN).⁴³ This official also said that this responsibility was granted to Chile's courts because lawmakers perceive the courts as

⁴³According to a Chilean mining official, Chile's Constitution was approved in 1980, but Chileans voted on October 25, 2020, to rewrite their Constitution. This official also said a special 155-member constitutional convention was democratically elected to submit a new draft of Chile's Constitution to voters in mid-2022.

Mining on Indigenous Lands in Australia, Canada, and Chile



In Australia, the Crown owns all mineral resources, but when mining on Indigenous freehold (owned) land, operators need to reach agreements with the Traditional Owners (Indigenous people) through their representative land council and receive consent by the relevant federal (Commonwealth) minister before exploring, according to Australian officials.



In Canada, the Crown has a duty to consult and accommodate Indigenous communities' concerns before authorizing mineral exploration, according to Canadian officials.



In Chile, the national government may be required to consult with Indigenous communities during the environmental impact assessment process, according to Chilean officials.

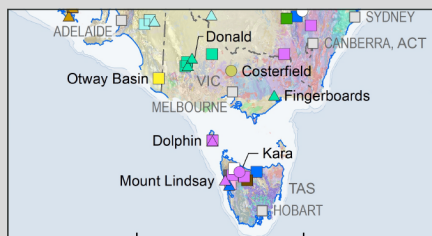
Sources: Australia, Canada, and Chile government mining officials and U.S. Department of State (graphics). | GAO-21-298

reliable and accountable. Generally, the courts grant mining leases upon request to anyone who complies with requirements, according to this official. Once the courts grant leases, SERNAGEOMIN is responsible for overseeing mine development, mineral production, and reclamation. In the reclamation stage, SERNAGEOMIN is responsible for closing the mine to a chemically and physically stable state using funding, such as financial assurance bonds, provided by operators, according to a SERNAGEOMIN official.⁴⁴

⁴⁴Reclamation in Chile is unique among the three selected countries because the government, rather than the operator, is responsible for closing the mine, unlike in Australia and Canada, and does not involve returning the land to its previous condition. Each country's reclamation process is discussed further in app. III.

Australia, Canada, and Chile Primarily Use Leasing to Manage Hardrock Mining, and Operators Pay Royalties and Corporate Income Taxes on Minerals Extracted

Australia, Canada, and Chile Make Digital Geologic Maps Available to Encourage Mine Development



Antimony	Indium
Bismuth, Cobalt, Platinum-group elements	Magnesium
Cobalt	Titanium
Graphite	Tungsten
Helium	Rare earth elements and other minerals

To attract investors and encourage leasing, the national governments of Australia, Canada, and Chile each developed their own digital geoscientific map of various minerals in their country, and each makes these maps publicly available. The above map is designed to show Australia's potential for mineral exploration and mine development.

Sources: GAO analysis of Australia, Canada, and Chile documents and an Australia mining website (photo). | GAO-21-298

In Australia, Canada, and Chile, operators generally need to obtain approval in the form of a lease, or an agreement that functions similar to a lease, from the appropriate government entity to explore for minerals and develop mines, according to government mining officials and documents. National and regional governments are responsible for granting these leases. However, some Canadian provinces also allow mineral exploration using a location system.

In Australia, operators generally need to obtain a lease to extract minerals through the regional government where the land is located and must follow the mine approval process for that particular region, according to *The International Comparative Legal Guide to: Mining Law 2019* (legal guide).⁴⁵ Before obtaining a mine development lease, operators need to acquire exploration leases, permits, or licenses, according to an Australian government document. Once these are acquired, operators may apply for a mining lease within the region where the minerals are located.

Canada uses two mining approaches to manage mineral exploration and extraction—the location and leasing systems. For individuals wanting to prospect, explore, and stake a claim that establishes a right to the minerals, most regional governments in Canada generally provide open access on Crown lands that do not have any registered mineral claims. However, Canadian government mining officials said that generally, prospectors must have licenses and, for an exclusive right to explore, some regions require a permit to be issued.⁴⁶ In addition, some Canadian regional governments require leases for mineral exploration, according to the legal guide. When individuals stake claims, these claims need to be registered and recorded, according to a Canadian mining official. To extract minerals, operators generally need to obtain leases, which can be done through the regional government where the planned mine site will

⁴⁵Global Legal Group, *The International Comparative Legal Guide to: Mining Law 2019, A practical cross-border insight into mining Law*, 6th ed. (London, United Kingdom: Stephens & George Print Group, 2018).

⁴⁶In Alberta, Newfoundland and Labrador, Saskatchewan, and Yukon, certain prospecting activities can be conducted without a permit or formal registration, according to the legal guide.

be located or through the Canadian federal government, according to a Canadian official and the legal guide.⁴⁷

In Chile, the tribunal courts at the national level grant leases, and the approval process is similar throughout the country. The approval process for acquiring a lease includes the following steps:

1. The operator files an electronic petition with the tribunal court closest to the point of interest.
2. The operator presents the mine's measurements and requests the lease from a judge.
3. The operator publishes the scope of the lease in a local bulletin.
4. The judge determines that the requirements have been met and there are no other claims on the point of interest.
5. The operator requests the lease from the judge.

Australia and Canada both impose maximum term limits on leases, ranging from 10 to 30 years, whereas Chile does not impose limits. In Australia and Canada, an operator can renew a lease if annual fees and royalties are paid and the operator complies with the terms of the lease and laws, according to an Australian government document and the legal guide. Chile does not impose a maximum term limit on leases, and mining operators need to pay annual fees to the General Treasury of the Republic and royalties (if applicable) to the National Tax Service to maintain their leases, according to a Chilean mining official and Chilean documents (see table 1).

⁴⁷In Canada, to obtain a lease for mineral extraction, a claimholder needs to be in good standing by paying annual rent and fees, according to the legal guide. The Yukon Territory's approach is to use the location and leasing systems to manage mining on certain lands within its boundaries; however, a Canadian official noted this region as an exception.

Table 1: Maximum Term Limits for Mine Development Leases in Australia, Canada, and Chile

Country	Lease term (in years)	Extension possible
Australia	21	Yes ^a
Canada	10-30 ^b	Yes ^{a, b}
Chile	Indefinite ^c	Not applicable

Sources: GAO analysis of *The International Comparative Legal Guide to: Mining Law 2019* and interview with Chilean government officials. | GAO-21-298

^aMining leases are renewable if the annual fees and royalties are paid and the operator has complied with the terms and conditions of the lease and law, according to an Australian mining document and a 2020 *Mining in Canada: overview*. Darrell W. Podowski et al., “Mining in Canada: overview” (Canada: Thomson Reuters: 2021).

^bThe duration of a lease differs among the Canadian provinces and territories.

^cA lease will expire if the annual fees and royalties are not paid. In Chile, mining agreements are referred to as “concessions.”

All three countries collect royalties and corporate income taxes on hardrock mineral extraction; however, each country has varying royalty rates and methods for determining them, according to government mining documents (see table 2).⁴⁸

⁴⁸Canada collected CAD1.8 billion in royalties and CAD980 million in federal corporate and regional income tax in 2018. Chile collected \$250 million U.S. dollars in royalties and approximately \$2.2 billion U.S. dollars in corporate income tax in 2018 from its state-owned copper company (CODELCO). Australian mining officials did not provide the total royalty or corporate income tax revenue collected for 2018. Royalties and taxes are part of a broader mining fiscal regime. For this reason, one would need to examine a country’s complete mining fiscal regime before directly comparing approaches used for collecting mining revenue, according to an individual knowledgeable about hardrock mining law and economics. Most taxes, such as capital gains taxes, as well as rents and fees, were outside the scope of this review.

Table 2: Royalty and Corporate Income Tax Rates on Hardrock Mineral Extraction in Australia, Canada, and Chile, as of 2020

Country	Royalty rates on the value of hardrock minerals produced (percent)	Corporate income tax rates on hardrock mineral extraction ^a
Australia ^b	Ranged from approximately 1 to 20	Ranged from 27.5 to 30 ^c
Canada	Ranged from 1 to 22.9	Ranged from 24 to 31 ^d
Chile	Ranged from 0 to 14	Tax on operators' income is 27%; tax on dividends and operators' profits is 35%.

Sources: GAO analysis of Australia, Canada, and Chile's mining documents. | GAO-21-298

^aAustralia assesses corporate income taxes at the federal level and not the regional level, Canada assesses corporate income taxes at the federal and regional levels, and Chile assesses corporate income taxes at the national level.

^bSome royalties were specific to mineral types.

^cThe full corporate income tax rate was 30 percent, and the lower tax rate was 27.5 percent for base-rate entities. A base-rate entity is an operator who had an aggregated turnover less than \$50 million from 2019 to 2020, and 80 percent or less of the operator's assessable income was base-rate entity passive income (e.g., royalties and rent).

^dThe federal government and the provinces or territories both assess a corporate income tax on mineral extraction income. The Canadian federal government assesses a corporate income tax on hardrock mineral extraction at a rate of 15 percent, and the provincial or territorial governments assess a corporate income tax on hardrock mineral extraction that ranges between 9 percent and 16 percent.

Australia and Canada's regional governments are responsible for collecting royalties.

- In Australia, some regional government mining documents indicated that, at the time of this review, the regional governments set their royalty rates according to the net market value of the minerals produced, and these rates sometimes depend on the type of minerals.⁴⁹ For example, in Victoria, the royalty rate was 2.75 percent of the net market value for most minerals, as of 2020.
- In Canada, a government official and document indicated that, as of 2020, the regional governments' royalties or mining taxes were based on net revenue or profit. For example, British Columbia and New Brunswick charged 13 percent and 16 percent of operators' net revenue, respectively.⁵⁰

⁴⁹The net market value is the market value of the mineral at the time it is first sold, transferred, or disposed of, less any costs reasonably, necessarily, and directly incurred by the mining operator in connection with the sale, transfer, or disposal.

⁵⁰The net revenue is the cumulative profit, which includes all revenues and costs, including capital costs to date.

As of 2020, Australia's federal government collected a corporate income tax on hardrock minerals extracted that ranged from 27.5 percent to 30 percent. Canada collected corporate income taxes on hardrock minerals extracted at both federal and regional levels. The combined federal and regional corporate income tax rate on hardrock minerals extracted ranged from 24 percent to 31 percent.

Furthermore, Chilean government documents indicate that the national government is responsible for collecting a special mining income tax and a corporate income tax on hardrock mineral extraction. The special mining tax, at the time of this review, was based on the amount of an operator's annual sales. The annual corporate income tax on hardrock minerals extracted was assessed at a rate of 27 percent of operator's income and 35 percent of dividends and operators' profits, as of 2020.⁵¹

Eleven Western U.S. States Each Have Multiple Governance Structures That Manage Hardrock Mining, and These States Primarily Use Leasing

Eleven western U.S. states that were in the highest mineral-value-producing region in 2018—Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming—collectively produced approximately a total of \$26 billion of minerals on federal, state, and private lands.⁵² These states each have multiple governance structures to manage hardrock mining, and these governance structures primarily use leasing to do so.

⁵¹This special mining income tax consists of three tax rates. For annual sales less than 12,000 metric tons, the special mining tax rate is zero. For annual sales between 12,000 and 50,000 metric tons, the rate is from 0.5 percent to 4.5 percent. For annual sales greater than 50,000 metric tons, the rate is from 5 percent to 14 percent.

⁵²These states are in a region—which included these 11 states, as well as Hawaii and Nevada—that the USGS identified as producing the highest value of minerals in the U.S. in 2018. The combined production value for minerals for the 13 states in this western region was approximately \$34 billion in 2018. See U.S. Geological Survey, *Mineral Commodity Summaries 2019*.

Responsibility for Managing Hardrock Mining Is Decentralized among Multiple Governance Structures in 11 Western States

Multiple governance structures within each of the 11 western states we reviewed manage hardrock mining on state-owned lands, including trust lands. These governance structures generally fall into two categories: (1) agencies that manage state-owned lands, including trust lands; and (2) those that regulate and oversee various stages of mining, including on state trust lands.

In general, agencies that manage trust lands in these states issue permits for hardrock mineral exploration and administer leases for mineral extraction on trust lands. These state trust land management agencies may generate revenue for their beneficiaries by leasing trust lands for activities such as mining, grazing, timber, renewable energy development, and recreation. In most states, a portion of this revenue is invested in a permanent fund, which can provide ongoing revenues for beneficiaries, such as educational institutions.⁵³ Elected or appointed boards, commissions, commissioners, or government officials lead the various agencies. For example, Arizona has an appointed commissioner, and New Mexico has an elected official who manage state trust lands.⁵⁴ In addition, Colorado manages its state trust lands by a Governor-appointed, five-person board—the State Board of Land Commissioners—that represents beneficiaries’ interests (see table 3).

Table 3: State Trust Land Management Agencies in 11 Western U.S. States

State	Agency	Leadership
Alaska	Alaska Mental Health Trust Authority	A seven-member board of trustees appointed by the Governor
Arizona	Arizona State Land Department	A commissioner appointed by the Governor
California	California State Lands Commission	A three-member commission, comprising the Lieutenant Governor, the State Controller (both of whom are elected state positions), and the Governor’s Director of Finance
Colorado	State Board of Land Commissioners	Five persons appointed by the Governor, with the consent of the Senate ^a
Idaho	State Board of Land Commissioners	A five-member board, comprising the Governor, Secretary of State, Attorney General, Superintendent of Public Instruction, and State Controller

⁵³Trust land management agencies act as a trustee and are to manage the land in the best interest of their beneficiaries. According to a Lincoln Institute of Land Policy report, all of the western states, except California, recognize some form of fiduciary responsibility associated with their state trust lands. See Culp, *State Trust Lands in the West*, 13.

⁵⁴In addition to an elected Commissioner in New Mexico, the state has a Land Trust Advisory Board to advise the Commissioner on state trust land policies and programs. The board represents the land trust’s beneficiaries and key constituents.

State	Agency	Leadership
Montana	State Board of Land Commissioners	A five-member board, comprising the Governor, Secretary of State, Attorney General, State Auditor, and the Superintendent of Public Instruction
New Mexico	New Mexico State Land Office	An elected constitutional officer in the executive branch
Oregon	State Land Board	A three-member board, comprising the Governor, Secretary of State, and State Treasurer
Utah	State and Institutional Trust Lands Administration	A seven-member board consisting of six members appointed to 6-year terms by the Governor, who appoints them from a list given by a nominating committee, as well as a seventh at-large member who is directly appointed by the Governor without requiring a nomination list
Washington	Board of Natural Resources	A six-member board, including the Governor or the Governor's designee, Superintendent of Public Instruction, Commissioner of Public Lands, a Director from the University of Washington, a Dean from Washington State University, and a representative of those counties that contain certain state forest lands ^b
Wyoming	State Board of Land Commissioners	A five-member board, comprising the Governor, Secretary of State, State Auditor, State Treasurer, and Superintendent of Public Instruction

Sources: GAO analysis of state mining documents and state mining websites. | GAO-21-298

^aUnder Colorado's Constitution, one member must have experience in each of the following areas: public primary or secondary education, production agriculture, local government and land use planning, and natural resource conservation. Colo. Const. art. IX, § 9, cl. 2.

^bSpecifically, state law provides that the Director of the University of Washington School of Forest Resources and the Dean of the Washington State University College of Agricultural, Human, and Natural Resources Sciences are to be members of the board. WASH. REV. CODE § 43.30.205.

Additional Agencies May Play a Role in State Trust Land Management



Topaz Mine (photo) produces beryllium minerals located in western Utah.

In addition to agencies that manage state trust lands and that regulate and oversee mine operations on trust lands, some states have other agencies that play a role in trust land management. For example, Utah and Wyoming have investment agencies to manage and optimize assets in their permanent land trusts.

Furthermore, some state legislatures have created advisory groups to provide policy recommendations. For example:

- The Alaska Minerals Commission makes annual recommendations to Alaska's Governor and legislature on ways to mitigate constraints on development of minerals in the state.
- The New Mexico State Land Trusts Advisory Board assists the State Land Commissioner in developing policies and programs for the state's trust lands.

Sources: GAO analysis of Alaska, New Mexico, Utah, and Wyoming documents. Photo is from the Utah Division of Oil, Gas and Mining. | GAO-21-298

In addition to state trust land management agencies, which play a role in leasing state trust lands, states have different agencies that regulate and oversee various stages of mining, including on state trust lands. These agencies are generally responsible for

- reviewing and approving mine plans of operations for proposed mines;
- overseeing mine operations, which includes ensuring mine safety, that state laws are followed, and mine sites are reclaimed; and
- determining acceptable amounts of financial assurances to ensure the mine is reclaimed once operations are completed.

Generally, an individual appointed by each state's Governor leads these agencies (see table 4).

Table 4: Different State Agencies Regulate and Oversee Hardrock Mining in 11 Western U.S. States

State	Agency (subcomponent)	Agency leadership	Leadership selection
Alaska	Department of Natural Resources (Division of Mining, Land, and Water)	Commissioner	Appointed by the Governor
Arizona	State Mine Inspector's Office (Reclamation Division)	State Mine Inspector	Elected at the state level
California	Department of Conservation (Division of Mine Reclamation)	Director	Appointed by the Governor
Colorado	Department of Natural Resources (Division of Reclamation, Mining and Safety) ^a	Executive Director	Appointed by the Governor
Idaho	Department of Lands (Resource Protection and Assistance Bureau)	Director	Appointed by the State Board of Land Commissioners
Montana	Department of Environmental Quality (Hardrock Mining Bureau)	Director	Appointed by the Governor
New Mexico	Department of Energy, Minerals and Natural Resources (Mining and Minerals Division)	Secretary	Appointed by the Governor
Oregon	Department of Geology and Mineral Industries	Governing Board	Appointed by the Governor
Utah	Department of Natural Resources (Division of Oil, Gas and Mining) ^b	Executive Director	Appointed by the Governor
Washington	Department of Natural Resources (Surface Mine Reclamation Program)	Commissioner of Public Lands	Elected at the state level
Wyoming	Department of Environmental Quality (Land Quality Division)	Director	Appointed by the Governor

Sources: GAO analysis of state governments' websites. | GAO-21-298

^aIn addition to the Division of Reclamation, Mining and Safety, the Colorado Mined Land Reclamation Act created the Mined Land Reclamation Board, in the Department of Natural Resources, as well as the Office of Mined Land Reclamation, which resides in the department's Division of Reclamation, Mining and Safety. The board consists of seven members, including five citizens appointed by the Governor, and is responsible for establishing regulations, standards, and policies for mine operations. In addition, the board conducts public hearings to issue permits for controversial mines. It also reviews violations of mining regulations to determine the appropriate remedy, such as revoking a mine permit, assessing civil penalties, or forfeiting financial assurances.

^bUtah's Board of Oil, Gas and Mining oversees the Division of Oil, Gas and Mining. The board comprises seven members appointed by the Governor and is responsible for policy-making.

Eleven Western States Primarily Use Leasing to Manage Hardrock Mining, and Operators Pay Royalties and Taxes

Eleven western states primarily use leases to guide mineral exploration and development on state trust lands, which is consistent with a federal law generally requiring that mineral deposits on state trust lands be

subject to lease by the state.⁵⁵ In these 11 states, leases are typically established after operators receive approval to explore for minerals.⁵⁶

The process for acquiring leases varies among the 11 western states. Specifically:

- In Idaho, New Mexico, and Utah, operators acquire leases through auctions generally managed by trust land management agencies.
- In Arizona, Montana, Washington, and Wyoming, operators acquire leases through an application submitted to trust land management agencies.
- In Alaska, California, Colorado, and Oregon, operators can use either of these processes.⁵⁷

Nine out of the 11 states can extend lease terms indefinitely. However, in two states, leases have a maximum term limit after extending the initial term. For example, in Oregon, trust lands can be leased for 10 years initially, and a lease can be extended for a maximum of 50 years in 10-year increments, if certain conditions are met (see table 5).

⁵⁵In 1927, Congress passed, and the President signed into law, the Jones Act, which expressly extended the school land grants to include sections with mineral resources. Act of January 25, 1927, Ch. 57, §1, 44 Stat. 1026 (codified as amended at 43 U.S.C. § 870). The extension was conditional on the relevant state leasing, rather than selling, the mineral rights and that all proceeds went for school purposes. *Id.* § 870(b). The states have adopted a variety of approaches to govern mineral development on state-owned lands. Pursuant to the Jones Act, however, the states generally employ some form of leasing to grant such rights. See Jensen, “Administering State Lands—What is the State’s Trust Responsibility?”

⁵⁶Not all states use the term “lease,” but the concept is similar. For example, Washington uses the term “mining contract,” and operators must obtain one before mining. The state maintains title to the land and establishes terms for use of the land, including duration of use, acreage limitations, and royalty terms. For purposes of this report, we use the term “lease” to refer to such agreements.

⁵⁷Alaska conducts leasing through both applications and competitive bidding on state trust lands. Colorado conducts either an auction or direct negotiation, depending on the mineral. California may also issue preferential leases through exploration permits. Oregon may approve a written application from a qualified applicant for a mining lease or may conduct a competitive bid to lease discovered minerals.

Table 5: Mine Development Lease Term Limits for 11 Western U.S. States

States	Initial lease term (in years)	Allowable lease term extensions
Alaska ^a	55	Lease can be extended indefinitely. ^b
Arizona	20	Lease can be extended indefinitely, in 20-year increments. ^c
California	20	Lease can be extended indefinitely, in 10-year increments. ^c
Colorado	10	Lease can be extended indefinitely. ^d
Idaho	20	Lease can be extended indefinitely. ^c
Montana	10	Lease can be extended indefinitely. ^c
New Mexico	3	Lease can be extended indefinitely. ^e
Oregon	10	Lease can be extended for a maximum of 50 years, in 10-year increments. ^c
Utah	10	Lease can be extended indefinitely. ^c
Washington	20	Contract can be extended for one 20-year term. ^f
Wyoming	10	Lease can be extended indefinitely, in 10-year increments. ^c

Source: GAO analysis of state mining documents. | GAO-21-298

Note: In these 11 western states, operators must pay annual rent and monthly royalties to continue a lease.

^aThese are the maximum term limits for Alaska state-owned lands that do not include trust lands. As of 2018, Alaska had approximately 94 million acres of state-owned lands, according to U.S. Geological Survey and U.S. Census Bureau data, and these lands include approximately 1 million acres of trust lands. On state trust lands, lease terms and extensions are negotiated.

^bFor state-owned lands that do not include trust lands, if all lease requirements are satisfied, the Alaska Department of Natural Resources has discretion to set the term of a renewed lease.

^cOperators must meet certain conditions to extend a lease.

^dThe State Board of Land Commissioners will determine renewal terms.

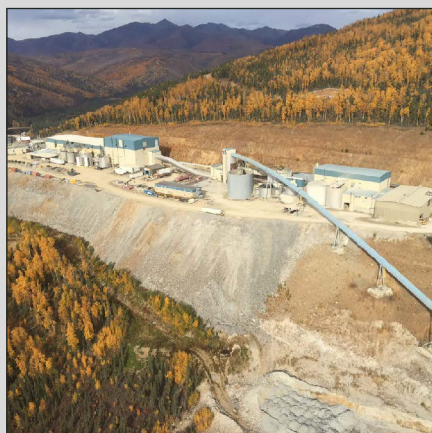
^eA lease is indefinite once an operator is producing enough of a mineral to cover costs and make a profit. If minerals are not discovered, the operator may apply for one extension of 2 years and two more extensions of 5 years each.

^fA mining contract is similar to what some other western states refer to as a lease. It is an agreement that outlines the terms for use of the land, such as duration of use and any acreage limitations.

Alaska is unique among the 11 states we reviewed because it uses two approaches on its 94 million acres of state-owned land. First, it uses a leasing system on its state trust lands (about 1 million acres).⁵⁸ Second, it uses a location system on state-owned land that does not include trust

⁵⁸In 1994, after a 1984 State Supreme Court ruling and years of subsequent litigation, in a settlement the Alaska Mental Health Trust Authority was reconstituted with 1 million acres of land (state trust land) to support mental health in Alaska. The land generates revenue by, among other things, leasing mineral exploration and development.

Alaska's Constitution Encourages Mine Development



Pogo Mine (photo) is an underground operation mining for gold, near Delta Junction, Alaska.

Alaska's constitution says the legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the state, including land and waters, for the maximum benefit of its people. Further, the Alaska constitution addresses the establishment of mineral rights and states that the legislature is to provide for the issuance of mineral leases. State Department of Natural Resources officials said mining was included in the constitution because it was a critical part of Alaska becoming a state.

Sources: GAO analysis of Alaska Department of Natural Resources documents, interview with Alaska state officials, and Alaska Department of Natural Resources (photo). | GAO-21-298

land (about 93 million acres).⁵⁹ Under Alaska's location system, an individual may explore and stake a mining claim to obtain the right to extract those minerals.

In general, operators in Alaska use the location system on state-owned lands that do not include trust lands and then convert the mine claim to a leasehold (lease), according to an Alaska mining official. Before advanced mineral exploration or development can begin, such as building permanent structures or storing waste rock, a mining claim needs to be converted to a mining lease, according to a state official. State-owned lands that do not include trust lands are designated for leasehold location only if other valuable resources might be present or if the surface has already been leased or sold for other uses.

These 11 western states collect multiple types of royalties, or taxes that are similar to royalties, for hardrock mining on state-owned lands, including trust lands, as we reported in June 2019.⁶⁰ Royalty rates vary among these states, but royalties are typically assessed on units, gross revenue, net smelter returns, or net proceeds.⁶¹ Units are generally assessed on the quantity or weight of minerals produced, and gross revenue is assessed as a percentage of the value of minerals extracted. Smelting is a refining process used to extract valuable metals from ores or other raw materials using melting and heating. Net smelter returns generally are assessed as a percentage of the value of the mineral but with deductions allowed for the costs of transporting and processing the minerals. Net proceeds rates are generally assessed as a percentage of the net proceeds (or profit) of the sale of the mineral, with deductions for various mining costs. For example, Idaho, New Mexico, and Montana

⁵⁹An approach involving the location system generally involves individuals locating minerals on public lands and staking a claim to obtain the exclusive right to extract those minerals without paying a royalty; however, in Alaska, for mining on both trust lands and state-owned lands that do not include trust lands, a royalty is due on production. See app. 1.

⁶⁰For more detailed information, see GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*.

⁶¹Royalties and taxes are part of a broader mining fiscal regime. For this reason, one would need to examine a jurisdiction's complete mining fiscal regime before directly comparing approaches used for collecting mining revenue, according to an expert on hardrock mining law and economics. Some taxes and fees, such as capital gains taxes and rents, were outside the scope of this review.

collect royalties based on net smelter returns, and their royalty rates range from 5 percent to 8 percent for various hardrock minerals.⁶²

For more information regarding these 11 states' governance structures and approaches for managing hardrock mining on their state-owned lands, primarily trust lands, see appendix IV.

Hardrock Mining on Tribal Lands Is Managed at the Tribal and Federal Levels, and Federal Law Requires the Use of Leases or Minerals Agreements

Hardrock mining on tribal lands is managed by governance structures at the tribal and federal government levels in accordance with the approaches established in tribal and federal law. Tribes decide whether to allow hardrock mining on their lands. If so, tribes and federal agencies are both involved in managing mining. Federal law requires the use of one of two approaches—leases or minerals agreements, as defined in regulation—when tribes allow mining on their lands.⁶³

Governance Structures at the Tribal and Federal Levels Manage Hardrock Mining on Tribal Lands

When tribes choose to allow hardrock mining on their lands, multiple entities at the tribal level may be involved in managing mining, depending on the requirements of tribal law, which may vary by tribe.⁶⁴ As of March 2021, the federal government recognized 574 tribes as distinct, independent political communities with certain powers of self-government, including power over their territory and members. Because of the differences in tribal law among these 574 federally recognized tribes, we did not evaluate individual tribal laws for managing mining on tribal lands.

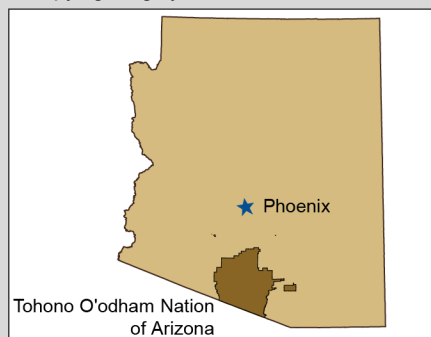
⁶²As previously mentioned, generated revenue from mining on state trust lands is typically for the benefit of public institutions, such as public schools, libraries, and state charitable institutions.

⁶³The regulatory definition of a minerals agreement is any joint venture, operating, production sharing, service, managerial, lease (other than a lease entered into pursuant to the Indian Minerals Leasing Act or Act of March 3, 1909), contract, or other minerals agreement providing for the exploration for, or extraction, processing, or other development of minerals in which an Indian mineral owner owns a beneficial or restricted interest, or providing for the sale or other disposition of the production or products of such minerals. 25 C.F.R. § 225.3.

⁶⁴For example, within the Tohono O'odham Nation of Arizona, district governments, as well as the tribe's legislative council, need to approve any exploration and mine development, according to Nation officials.

Tohono O’odham Nation of Arizona’s Perspective on the Effects of Hardrock Mining on the Tribe

The Tohono O’odham Nation of Arizona, or "Desert People," reside in the Sonoran Desert of southern Arizona. The Tohono O’odham Nation of Arizona, a federally recognized tribe, has one of the largest reservation landmasses in the U.S., occupying roughly 2.8 million acres.



A hardrock mining official from the Nation said that adverse effects of mining on the tribe date back to at least 1623, when the Spanish were exploring what is now Arizona. Spanish colonists enslaved members of the Nation by forcing them to work on mine sites. In 2019, the Chairman of the Nation testified that more recent mining operations on the tribe’s lands were still detrimental to the tribe and were permitted under a system that allowed operators to claim minerals underneath tribal lands without the tribe’s consent. He said these mining operations polluted an underground aquifer, leading the U.S. Environmental Protection Agency to designate the area as a Superfund Site (a site designated for cleanup because of contamination with hazardous waste).

Sources: Interview with Tohono O’odham Nation of Arizona officials; and Edward D. Manuel, Chairman, Tohono O’odham Nation of Arizona, testimony before the U.S. House of Representatives House Natural Resources Committee Subcommittee on Energy and Mineral Resources, 116th Cong., 1st sess., May 9, 2019. | GAO-21-298

BIA officials said that, according to their work, there are few tribes that have allowed hardrock mining on their lands.⁶⁵

According to ONRR data, two tribes had inactive mines on their lands in 2018—the Tohono O’odham Nation of Arizona and the Pueblo of Zia, New Mexico.⁶⁶ In 2007—the most recent year of significant production—approximately \$1.5 million in copper was extracted from the Tohono O’odham Nation’s Mission Complex mine.

When hardrock mining occurs on tribal lands, it is also managed through governance structures at the federal level and is generally subject to two federal laws—the Indian Mineral Development Act of 1982 and the Indian Mineral Leasing Act—and the implementing regulations for these laws. Federal agencies that are involved, along with tribes, in managing mining on tribal lands include BIA, ONRR, and the Bureau of Land Management (BLM) within Interior. Interior agencies are involved because the Indian Mineral Development Act of 1982 and the Indian Mineral Leasing Act require the Secretary of the Interior’s approval for mining on tribal land and because of other statutory and regulatory requirements. BIA officials said they provide technical and economic advice and services to tribal mineral owners to help them develop their mineral resources, among other things. ONRR provides revenue management services, such as ensuring that methods used to compute royalties are in accordance with federal laws and regulations for mineral development on tribal lands. BLM oversees mining operations to ensure compliance with its regulatory requirements for mining on federal lands to help prevent, mitigate, or manage public health, safety, and environmental hazards.

⁶⁵Determining the reasons for tribes’—other than the Tohono O’odham Nation of Arizona—decisions on whether to allow mining on their lands was beyond the scope of this report. However, a report by the Revenue Watch Institute examined issues involving mineral extraction and tribal sovereignty and noted that a tribe’s decision whether to allow mining on its lands can be controversial, as such decisions are elsewhere in the U.S. Further, the authors concluded that some tribes do not have the necessary infrastructure to manage their own extractive activities; federal funding for capacity development has been limited; and tribes are diverse and may be pursuing multiple goals, such as preserving culture, land, and resources, instead of maximizing revenue. Maura Grogan, Rebecca Morse, and April Youpee-Roll, *Native American Land and Natural Resource Development* (New York, NY: Revenue Watch Institute, 2011), 3-5.

⁶⁶However, these tribes were still receiving payments from mine operators in 2018. We interviewed officials from the Tohono O’odham Nation of Arizona and received information regarding mining on their land, but the Pueblo of Zia, New Mexico, did not respond to our request for an interview or information.

Tribes Use Leases and Minerals Agreements to Manage Hardrock Mining, and Operators Pay Royalties to Mine on Tribal Land

Hardrock Minerals' Locations May Be Publicly Available

Federal regulations require exploration permit holders for tribal land to share data collected regarding their operations with the tribal mineral owners and the Secretary of the Interior, unless otherwise provided in the permit. Where no time period is prescribed in the permit, the Secretary may release such information after 6 years, with the consent of the tribal mineral owner. In addition, the Bureau of Indian Affairs posts maps of the general location of various mineral resources on Indian lands.

Sources: 25 C.F.R. § 211.56(c); and Bureau of Indian Affairs' website <https://www.indianaffairs.gov/as-ia/leed/division-energy-and-mineral-development/minerals>, accessed January 3, 2020. | GAO 21 298

When tribes allow exploration for hardrock minerals on their trust and restricted fee land, a permit, lease, or minerals agreement is required. If mine development occurs, a lease pursuant to the Indian Mineral Leasing Act or a minerals agreement pursuant to the Indian Mineral Development Act of 1982 is required. Requirements for leases and minerals agreements are specified in these two federal laws and their implementing regulations.

Exploration permits under the Indian Mineral Leasing Act. Permits to conduct geological and geophysical operations (exploration) on tribal lands need to be approved by the Department of the Interior's Secretary, with the consent of the tribe. Permits must describe the area to be explored, the duration of the exploration, and the consideration to be paid the tribe (compensation). Unless specifically stated in the permit, permits cannot (1) give permit holders an option or preference rights to a lease or other development contracts; or (2) authorize the production or removal of minerals, except samples for assay (analysis) and experimental purposes.

Leases for exploration and mine development under the Indian Mineral Leasing Act. Tribes can enter into leases to explore for and develop hardrock minerals on tribal lands, pursuant to the Indian Mineral Leasing Act or the Indian Mineral Development Act of 1982 (discussion about leasing under the Indian Mineral Development Act of 1982 is in the next section). If a tribe decides to lease tribal land pursuant to the Indian Mineral Leasing Act, it can advertise leases for bid, obtain permission from the Secretary of the Interior to negotiate for and enter into a lease with the operator, or request that the Secretary advertise or negotiate a lease on the tribe's behalf. Any lease the tribe enters into by bid or negotiation must be approved by the Secretary. The tribe must consent to any lease advertised or negotiated by the Secretary. The regulations implementing the act establish requirements for any leases of tribal land for mining. For example, the length of the lease cannot exceed a duration of 10 years but can continue as long as minerals are produced in paying quantities, unless the lease specifies otherwise.⁶⁷ In addition, leases are to be contained within one U.S. governmental survey section of land and not to exceed 1 square mile (640 acres). However, a lease can include multiple hardrock minerals.

⁶⁷Paying quantities generally means that operators are producing enough of a mineral to cover their costs and make a profit.

Hardrock Mining on Tribal Land

As of July 2020, the Tohono O’odham Nation of Arizona had two inactive copper mines—the American Smelting and Refining Company LLC Mission Complex mine and the Cyprus Tohono Corporation mine. The Mission Complex mine is located on a mix of land owned by the company, tribe, and individual Indians. Different laws and regulations govern leasing of land owned by individual Indians in trust or restricted fee status, which are outside the scope of this report. The Cyprus Tohono Corporation mine is located on tribal land.



Mission Complex Mine (photo)

Sources: Interview with Tohono O’odham Nation of Arizona officials; photo is from Arizona State Land Department. | GAO-21-298

Once the Secretary approves a lease pursuant to the Indian Mineral Leasing Act, BLM oversees mining operations, including analyzing potentially harmful effects as well as inspecting reclamation activities during operations and upon cessation or abandonments of operations. For example, in the Tohono O’odham Nation of Arizona’s experience, BLM has tried to hold an operator accountable for its reclamation obligations. However, doing so has been difficult because the operator filed for bankruptcy, which has resulted in the operator not paying the tribe sufficient money for reclaiming one of its two mines, according to tribal officials. In addition, these officials said the operator’s workers have been on strike since 2019. The Indian Mineral Leasing Act’s implementing regulations require leaseholders to furnish a bond in an amount sufficient to ensure compliance with all terms and conditions of the lease and the applicable statutory and regulatory requirements. However, with the approval of the Secretary of the Interior, operators may file a \$75,000 bond for all leases in any one state or a \$150,000 bond for all leases nationwide. Furthermore, leases are also subject to BLM regulatory reclamation requirements. These requirements specify that BLM is to ensure that reclamation and closure of mining operations be completed in an environmentally sound manner.

In addition, leases under the Indian Mineral Leasing Act are subject to ONRR’s regulations for reporting, accounting, and auditing, unless the Secretary approves a lease with alternative provisions. ONRR collects royalties for leases and deposits them in the tribe’s trust account for tribal trust land leases. The minimum royalty rate is 10 percent of the value of what is produced and sold from the lease at the nearest shipping point. However, a lower royalty rate is allowed if it is determined to be in the best interest of the tribe or if a tribal constitution, bylaw, charter, ordinance, or resolution requires a lower royalty rate.

Minerals agreements for exploration and mine development under the Mineral Development Act. Instead of entering into leases for exploration and mine development pursuant to the Indian Mineral Leasing Act, tribes can choose to enter into minerals agreements pursuant to the Indian Mineral Development Act of 1982. Minerals agreements are contracts, leases, or other types of agreements. The Indian Mineral Development Act of 1982 helps ensure that tribes have more responsibility in overseeing and greater flexibility in managing their mineral resources, according to BIA officials. While allowing greater flexibility, these implementing regulations also specify the requirements for secretarial approval of minerals agreements. In addition, these regulations specify the topics that minerals agreements must address, if

applicable, which include outlining the method of payment and amount of compensation the operator must pay to the tribe, bond requirements, and proposed manner and time of performance of reclamation and restoration activities.

To help ensure that these and other topics are addressed, BIA developed a checklist of components that need to be included when developing minerals agreements (see app. V). Under the regulations, minerals agreements must require operators to post bonds in an amount sufficient to ensure compliance with all of the minerals agreement's terms and conditions and applicable laws and regulations. However, with approval of the Secretary of the Interior, the regulations permit the operator to file a \$75,000 bond for all minerals agreements in a state or a \$150,000 bond for all minerals agreements nationwide. In addition, the Secretary of the Interior has discretion to increase the required amount of a bond for a minerals agreement.

The Indian Mineral Development Act of 1982's implementing regulations specify the topics that minerals agreements must address but do not specify the number of acres the minerals agreements should cover or the duration of the agreements. Not having a set number of acres incentivizes operators to negotiate agreements with tribes because the lease can cover large tracts of land, according to BIA officials. These officials also said that operators generally prefer to negotiate agreements with a duration of at least 20 years with the tribes because such agreements allow operators time to recoup their initial capital expenses. Minerals agreements can include multiple hardrock minerals and, according to a BIA official, they are tailored to the tribe and the mining project whereby all but some terms are negotiable.

Similar to mine development under a lease pursuant to the Indian Mineral Leasing Act, once the Secretary approves a minerals agreement, BLM oversees mining operations to ensure compliance with its regulatory requirements for mining on federal lands. Minerals agreements are also subject to ONRR's regulations, unless the Secretary approves an agreement with alternative provisions addressing the issues of valuation, method of payment, accounting, and auditing.

Other federal requirements for exploration and mining on tribal lands. Mineral exploration and mine development on tribal lands are also subject to additional federal requirements. For example, the Clean Water Act generally prohibits the discharge of pollutants into the waters of the

U.S. from point sources, such as mines.⁶⁸ In addition, Interior's approval of leases and minerals agreements for tribal lands is subject to the National Environmental Policy Act of 1969.⁶⁹ Under this law and its implementing regulations, federal agencies are generally required to evaluate the potential effects of a proposed project on the environment. If the project is likely to have significant effects on the environment, agencies must prepare an environmental impact statement.

⁶⁸Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500, § 2, 86 Stat. 816 (codified as amended at 33 U.S.C. §§ 1251-1387) (commonly referred to as the Clean Water Act).

⁶⁹Pub. L. No. 91-190 (1970) (codified at 42 U.S.C. §§ 4321-4347).

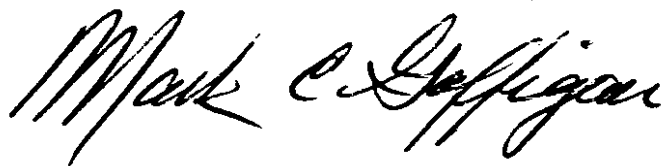
Agency Comments

We provided a draft of this report to the Department of the Interior for its review and comment. In addition, we provided portions of the report to the governments of Australia, Canada, Chile, Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, Wyoming, and the Tohono O'odham Nation of Arizona to verify key facts and statements. We obtained technical comments and corrections from the Department of the Interior and these country, state, and tribal governments, which we incorporated as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committee, the U.S. Secretary of the Interior, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gaffiganm@gao.gov. Contact points for our Offices of Congressional Relations and of Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VI.

Sincerely yours,



Mark E. Gaffigan
Managing Director, Natural Resources and Environment

Appendix I: U.S. Federal Systems for Managing Mining of Minerals

Federal agency data showed that 872 mine operations, most of which were hardrock operations, were authorized to produce solid minerals on federal lands as of September 30, 2018.¹ The U.S. federal government owns about 640 million surface acres—about 28 percent of the nation's land.² Federal lands consist of public domain and acquired lands. Public domain lands usually were never in state or private ownership, whereas acquired lands are generally those granted or sold to the U.S. by a state or citizen. About 90 percent of all federal lands are public domain lands, while the remaining 10 percent are acquired lands, according to a government report.³ Different statutes and systems govern the management of solid mineral extraction on public domain and acquired lands.

In a previous report, we grouped these minerals and their associated mine operations⁴ into four categories:⁵

- **Hardrock minerals managed under the location system.** Hardrock minerals managed under the location system include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872.⁶ This act allows individuals to locate minerals on public domain lands (which represent about 90 percent of all federal lands), unless they have been closed or “withdrawn” from mineral entry, and stake a claim to obtain the exclusive right to extract those minerals, without paying a federal royalty. Claim holders are to pay one-time per claim fees due at the time of recording the mining claim. The Department of the Interior’s Bureau of Land Management (BLM) and the Department of Agriculture’s U.S. Forest Service each maintain separate programs to evaluate and approve the locatable hardrock operations on the lands they manage. For areas open to mining, individuals may conduct certain mining activities without notification to

¹GAO, *Mining on Federal Lands: More Than 800 Operations Authorized to Mine and Total Mineral Production is Unknown*, [GAO-20-461R](#) (Washington, D.C.: May 28, 2020).

²Congressional Research Service, *Federal Land Ownership: Overview and Data*, R42346 (Washington, D.C.: Feb. 21, 2020).

³Congressional Research Service, *Federal Land Ownership*, 5.

⁴The term “mine operation” refers to everything associated with extraction or production of a mineral, which can include a mill site, processing facility, and any associated infrastructure, according to agency officials.

⁵[GAO-20-461R](#).

⁶30 U.S.C. §§ 22 *et seq.*

or approval by these agencies if the exploration does not result in surface disturbance above a certain threshold. If exploration activity is expected to result in surface disturbance above such threshold, agency notification or approval may be required. In addition, operators are not required to mine locatable minerals; the claim holder may maintain a mining claim as long as the claim holder pays an annual maintenance fee. While operators are required to pay the annual maintenance fee, they pay no royalty to the federal government on the minerals produced.

- **Hardrock minerals managed under the leasing system.** Hardrock minerals authorized under a leasing system include minerals such as gold, silver, and copper that are generally found on lands acquired by the Forest Service under the Weeks Act.⁷ BLM uses a leasing system for these minerals. In general, using leases allows the federal government to maintain title to the land and establish terms for use of the land, including duration of use, acreage limitations, and royalty terms. For leasable hardrock minerals, operators must obtain federal authorization through a permit, license, or lease, depending on the activity to be conducted, before conducting mining activity. A lease gives operators the exclusive right to extract the minerals specified in the lease for the term of the lease. The initial term of a hardrock mining lease is not to exceed 20 years, but the lease can be renewed for 10 years at the end of the initial term and for following 10-year periods. Furthermore, operators must pay the federal government a royalty rate—a percentage of the quantity or gross value of the output of the minerals produced—as specified in the lease.
- **Nonenergy solid minerals.** Nonenergy solid minerals include minerals such as phosphate and sodium found on federal lands that are subject to the Mineral Leasing Act of 1920 and the Mineral Leasing Act for Acquired Lands of 1947.⁸ Individuals may extract these minerals using a leasing system that BLM administers.

⁷The Act of March 4, 1917, authorized the Secretary of Agriculture to issue regulations permitting mineral resource development on lands acquired under the Weeks Act. 16 U.S.C. § 520. Regulations issued under this provision authorized mineral removal subject to the payment of fees, rentals, and royalties commensurate with the value of the mineral resources. 36 C.F.R. § 251.6 (1938). Reorganization Plan No. 3 of 1946 transferred these responsibilities to the Secretary of the Interior. 60 Stat. 1097, 1099-1100 (1946).

⁸Mineral Leasing Act for Acquired Lands of 1947, 61 Stat. 913 (1947) (codified as amended at 30 U.S.C. §§ 351–359) and Mineral Leasing Act of 1920, 41 Stat. 437 (codified as amended at 30 U.S.C. § 181 *et seq.*).

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- **Coal.** Coal may be extracted from federal lands under the Mineral Leasing Act of 1920 and the Mineral Leasing Act for Acquired Lands of 1947 using a leasing system that BLM administers. Interior's Office of Surface Mining Reclamation and Enforcement or an approved state agency regulates coal mine operations.⁹

⁹The surface effects of coal mining in the U.S. are regulated under the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which also created the Department of the Interior's Office of Surface Mining and Enforcement to administer the act. Pub. L. No. 95-87, 91 Stat. 445 (codified as amended at 30 U.S.C. §§ 1201-1328). SMCRA allows an individual state or Indian tribe to develop its own program to implement the act if the Secretary of the Interior finds that the program is in accordance with federal law.

Appendix II: Governance Structures and Approaches Used to Manage Hardrock Mining in Various Jurisdictions

Table 6: Summary of Governance Structures and Approaches for Managing Hardrock Mining in Australia, Canada, Chile, 11 Western U.S. States, on Tribal Lands Subject to Federal Law, and on U.S. Federal Lands

Jurisdiction	Governance structures	Value of minerals produced in 2018 (in U.S. dollars)	Mining approach used	Government approval for right to mine	Lease terms	Royalties collected and rates (percent)
Selected mineral-producing countries						
Australia	Primarily state and territorial agencies	82 billion	Leasing	Yes	Varies by location; generally 21 years	Yes; ranges from approximately 1 to 20
Canada	Primarily provincial and territorial agencies	38 billion	Both location and leasing; primarily leasing ^a	Varies by location; primarily leasing	Varies by location; 10-30 years	Yes; ranges from 1 to 22.9
Chile	Judicial court at national level and national agencies	46 billion	Leasing	Yes	Indefinite	Yes; range from 0 to 14
United States						
11 western states ^b	Trust land management and mine oversight agencies	26 billion ^c	Leasing; with location also used in Alaska ^a	Yes	Varies; 3-55 years, with extension possible	Yes for both locatable and leasable minerals, range from 2 to 10
Indian Tribes ^d	Tribes and U.S. federal agencies ^e	0 ^f	Leasing and minerals agreements	Yes; tribal and federal	Varies (e.g., 10 years, with extensions possible) ^g	Varies (e.g., 10) ^h
U.S. government	Federal: U.S. Forest Service and Bureau of Land Management	Unknown for locatable; 550 million for leasable minerals ⁱ	Both leasing and location; primarily location ^j	No for locatable; ^k yes for leasable minerals	For leasing, initial term of 20 years, with 10-year extensions possible	No for locatable; ^l yes for leasable minerals (rates vary; no minimum rate) ^m

Source: GAO analysis of information on governance structures and approaches in Australia, Canada, and Chile, 11 western U.S. states, on tribal lands subject to federal laws and regulations, and on U.S. federal lands. | GAO-21-298

Note: We define hardrock minerals as precious metals (such as gold, platinum, and silver), nonferrous metals (such as aluminum, copper, and lead), gemstones, and some varieties of clay and stone.

^aAlaska and Canada use both leasing and location approaches. Specifically, Alaska uses a location approach on its state-owned lands that does not include trust lands, and a leasing approach on its state trust lands. In Alberta, Newfoundland and Labrador, Saskatchewan, and Yukon, certain prospecting activities can be conducted without a permit or formal registration, according to *The International Comparative Legal Guide to: Mining Law 2019*, 6th ed. (London, United Kingdom: Global Legal Group).

^bHardrock mining on state-owned lands in Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming.

^cAccording to 2018 information in a report from the U.S. Department of the Interior, U.S. Geological Survey, *Mineral Commodity Summaries 2019* (Reston, VA: Feb. 28, 2019), 10-11.

^dThis table presents information on hardrock mining on tribal trust and restricted fee lands (tribal land) subject to the Indian Mineral Leasing Act and Indian Mineral Development Act of 1982. Tribal trust land is land the federal government holds the legal title to, but the beneficial interest remains with the Indian tribe. Indian tribes hold title to tribal restricted fee land, but there are legal restrictions against alienation or encumbrance of the land.

^eFederal agencies involved include the Bureau of Indian Affairs, Office of Natural Resources Revenue, and Bureau of Land Management within the Department of the Interior.

^fAccording to information provided by the Office of Natural Resources Revenue, two tribes had hardrock mines on their lands in 2018, but these mines were not producing minerals at that time.

^gThe lease terms vary, depending on whether the mining is being conducted pursuant to the Indian Mineral Leasing Act or the Indian Mineral Development Act of 1982. Under the Indian Mineral Leasing Act, leases are for a term of 10 years but continue as long as minerals are produced in paying quantities, unless the lease specifies to the contrary. In contrast, the Indian Mineral Development Act of 1982 and its implementing regulations do not prescribe limits on the duration of the tribes' minerals agreements.

^hThe royalty rates vary, depending on whether the mining is being conducted pursuant to the Indian Mineral Leasing Act or the Indian Mineral Development Act of 1982. Under the Indian Mineral Leasing Act, the minimum royalty rate is 10 percent of the value of what is produced and sold from the lease at the nearest shipping point; but a lower royalty rate is allowed if it is determined to be in the interest of the tribe or if a tribal constitution, bylaw, charter, ordinance, or resolution requires a lower royalty rate. In contrast, the Indian Mineral Development Act of 1982 and its implementing regulations do not prescribe a specific royalty rate for minerals agreements.

ⁱFederal agencies generally do not collect data from hardrock mine operators on the amount and value of hardrock minerals extracted from federal lands because there is no federal royalty that would necessitate doing so. See GAO, *Mining on Federal Lands: More Than 800 Operations Authorized to Mine and Total Mineral Production is Unknown*, [GAO-20-461R](#) (Washington, D.C.: May 28, 2020).

^jUnder the location approach, individuals may generally locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals. Operators may conduct some mining activities without obtaining authorization from the responsible land management agency if those activities do not result in surface disturbance above a certain threshold. Under the leasing approach, operators must obtain federal agency authorization through a permit, license, or lease, depending on the activity to be conducted, before conducting mining activity. Leasing generally occurs on lands acquired by the U.S. Forest Service, but the Bureau of Land Management also administers a leasing approach.

^kAlthough government approval is not required for operators to stake a claim and, therefore, obtain the right to mine on a particular parcel of land, approval is required for most mining activities resulting in a surface disturbance, as noted previously.

^lAlthough payment of royalties is not required for locatable hardrock minerals, operators must pay an annual claim maintenance fee in order to maintain mining rights.

^mUnder the leasing approach, operators must pay the federal government a royalty—the rate is a percentage of the quantity or gross value of the output of the minerals produced—as specified in the lease.

Appendix III: Governance Structures and Approaches That Australia, Canada, and Chile Use to Manage Hardrock Mining

This appendix provides individual summaries of the governance structures and approaches that Australia, Canada, and Chile use to manage hardrock mining.¹ These summaries are based on government documents provided by officials in Australia, Canada, and Chile; telephone interviews with Chilean and Canadian government officials; and other publicly available information.²

Each country's summary includes

- a description of hardrock mining governance structures, such as agencies and courts; and
- a description of the country's mining approaches organized by the four primary stages of hardrock mining:
 - **Mineral exploration.** This section describes aspects of mining, such as the ways operators acquire legal rights to prospect, explore, and mine, as well as requirements for staking a claim or applying for permits and leases.³
 - **Mine development.** This section describes whether environmental reviews are required, as well as the approaches for developing mines, which primarily includes the lease acquisition processes and lease limitations, which are established before operators can begin constructing a mine site.
 - **Mineral production.** This section summarizes the royalties and corporate income taxes on hardrock mineral extraction that governments may collect on the minerals that operators mine, depending on the type of approach used.⁴

¹Regional governments manage hardrock mining in Australia and Canada. For this report, "regional government" includes state, provincial, or territorial governments.

²In response to Australian government officials' preference, we communicated with them via email rather than interviews when gathering information on Australia's management of hardrock mining.

³In general, under a lease, a government maintains title to the land and establishes terms for use of the land, including duration of use, land area limitations, and royalty terms. Countries may refer to mining agreements differently. Both Australia and Canada refer to them as licenses, permits, or leases, and Chile refers to them as concessions. For the purposes of this report, we refer to Australia, Canada, and Chile's mining agreements as leases, unless otherwise noted.

⁴Royalties and taxes are part of a broader mining fiscal regime. Taxes other than corporate income taxes, such as capital gains taxes, as well as rents and fees, were outside the scope of this review.

**Appendix III: Governance Structures and
Approaches That Australia, Canada, and Chile
Use to Manage Hardrock Mining**

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- **Reclamation.** This section explains whether reclamation and mine closure plans—that may discuss topics such as the ways operators will reshape and revegetate disturbed areas—are required. It also summarizes various financial assurance requirements, such as the amount and types accepted.

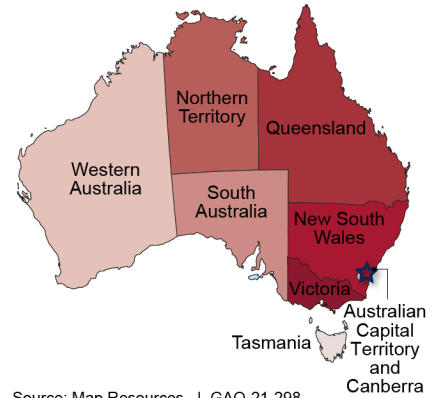


Yandicoogina Mine in Western Australia

Source: Rio Tinto. | GAO-21-298

Hardrock Mining in Australia

In 2018, Australia produced about \$82 billion of hardrock minerals, according to the World Mining Congress—a United Nations-affiliated organization. In 2020, it ranked in the top five countries for production of minerals such as copper, gold, and iron ore, according to a Geoscience Australia document.



Source: Map Resources. | GAO-21-298

Governance Structures for Managing Mining

Governance Structures and Mineral Ownership

Australia consists of six states (New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) and two federal territories (Northern Territory and Australian Capital Territory), each with their own legislative frameworks. Governing powers and responsibilities are divided between the federal (Commonwealth), state, and territorial governments, according to our review of *The International Comparative Legal Guide to: Mining Law 2019* (legal guide), government information, and interviews with knowledgeable officials. Collectively, these governments are referred to as the Crown. The Crown generally owns all mineral resources.

In the Australian Capital Territory, there were no hardrock mines as of March 2021.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

States and territories have separate legislative frameworks to authorize mineral prospecting (exploration), according to our review of an Australian Trade and Investment Commission document, the legal guide, and information from Australian government mining officials. They do so through a grant by the Crown in the form of exploration permits, licenses, or leases. For example, all states and the Northern Territory recognize a right to conduct large-

scale exploration for minerals through the grant of an exploration license or permit. In addition, most states and territories recognize a right to “fossick,” also known as prospecting, for minerals on a small scale.

Some differences among the states and territories regarding the authority to explore include the following:

- In South Australia and Western Australia, an exploration licensee also has a right to apply for and receive a mining lease or leases.
- In the Northern Territory, most mining occurs on Aboriginal freehold (owned) land, so operators need to reach agreements with the Traditional Owners (Indigenous peoples) through a land council and receive consent from the relevant Commonwealth minister before exploring.

Duration and Land Area Limitations for Permits, Licenses, or Leases

In Australia, exploration rights are generally granted for 1 to 4 years, but in Victoria, an operator’s exploration rights can be granted for a term of up to 10 years, according to the legal guide.

Exploration requirements vary by state or territory. For example, the area of land within the state that is granted under a mineral claim must be square, no greater than 50 meters by 50 meters, except where the external boundaries of the land available for granting make such a shape impractical, according to a New South Wales mining document. In this case, the maximum area must not exceed 2,500 square meters.

Assessing Environmental Impacts

An application for an exploration license must include information related to environmental impacts, although these requirements vary by state and territory, according to our review of the legal guide. In addition, environmental approval occurs at each stage of mining.

The states and Northern Territory are the main authorities for environmental management of mines. However, mining projects also require an environmental review under the Commonwealth’s Environment Protection and Biodiversity

Conservation Act 1999, which provides a legal framework to protect and manage matters of national environmental significance, according to a government mining official and website.

Requirements for Keeping a Permit or License

Requirements vary by state and territory. For example, in Western Australia, operators with exploration licenses are required to spend funds on mineral exploration. Furthermore, some Australian states, such as Western Australia, impose an obligation to surrender a portion of the area of an exploration license back to the landowner at specified intervals.



Mine Development

Leasing

A mining lease is required in order to conduct commercial mining activities in any state or territory, according to the legal guide. Additionally, in certain states, only the holder of an existing license or permit within that jurisdiction may apply for a mining lease.

Other Required Approvals

The requirement for zoning and planning approvals depends on the local and regional planning structures in which exploration or mining activities are proposed, according to the legal guide. Construction of buildings or mining infrastructure will generally necessitate regional government planning approvals. There may also be requirements to notify state or territorial governments of mining applications and proposals. Furthermore, foreign operators need to submit an application to Australia's Foreign Investment Review Board.

Multiple Minerals Covered by Leases

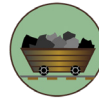
In most states, a special exploration license that allows exploring for gemstones and semiprecious metals may overlap with other mining claims, leases, or licenses, according to the legal guide. Most jurisdictions do not permit an operator to conduct mining or exploration activities for minerals other than those included in the lease or exploration license.

Duration and Land Area Limitations for Leases

Leases vary by state and territory. Mining leases are generally granted for a 21-year term, except in Queensland, where terms vary for each lease, according to the legal guide. Leases may be renewed in some circumstances. Furthermore, land area limitations vary, depending on the size of the identified ore body.

Requirements for Keeping a Lease

Requirements for keeping a lease vary by state and territory. Operators generally need to pay compensation for use of the land to any existing owner or occupier, pay rent to the government, satisfy minimum requirements to spend funds on mineral exploration, and submit annual reports to the relevant governmental department, according to the legal guide.



Mineral Production

Government Royalties or Taxes

Compensation in the form of royalties is paid to a state or territory for the extraction and sale of Crown mineral assets, according to statements from an Australian government mining official and our review of Australia's 2020 Energy and Mineral Resources Investor Guide. Royalty structures and rates vary by mineral across the states and territories but are generally imposed as a percentage of the ad valorem (value of production) or, less commonly, the volume of production.

Australia's Hardrock Mining Royalty and Corporate Tax Rates, as of 2020

Jurisdiction	Royalty rate
Australian Capital Territory	Not applicable; no mining operations existed.
New South Wales	Royalties were based on the value of production. The base-rate was 4 percent of value of the mineral once it is extracted and brought to the surface.
Northern Territory	Royalties for most minerals were based on the net value. The minimum royalty was based on the gross production value. The royalty was the greater of 20 percent of net value (less AUD10,000) or a percentage—ranging from 1 percent to 2.5 percent (depending on the year)—of the gross production value.
Queensland	Royalties for minerals generally were based on gross production value, with some permitted expenses deducted. For cobalt, copper, gold, lead, nickel, silver, and zinc, the royalty rate was 2.5 percent, but it could vary between 2.5 percent and 5 percent.
South Australia	For mineral ores and concentrates, the rate was 5 percent of the mineral's value.
Tasmania	Royalties were paid as a percentage of net sales and profit. The rate was 1.9 percent, plus profit, with a maximum of 5.35 percent.
Victoria	The royalty rate was 2.75 percent of the net market value for all minerals other than lignite. ^a

Jurisdiction	Royalty rate
Western Australia	The royalty rate was based on value of production. ^b The rate was 2.5 percent for metal, 7.5 percent for bulk material, and 5 percent for concentrate material. In some cases, an alternative to royalty value applied (e.g., nickel).
Jurisdiction	Corporate tax rate
Australia's federal government	The full corporate tax rate was 30 percent, and the lower tax rate was 27.5 percent for base-rate entities. ^c

Sources: GAO analysis of Australian federal, state, and territorial documents. | GAO-21-298.

^aRoyalties were not collected for gold produced on an exploration license or the first 2,500 ounces of gold produced each year.

^bThis was broadly calculated as the quantity of the mineral in the form in which it is first sold, multiplied by the price in that form, minus any allowable deductions.

^cA base-rate entity is an operator who had an aggregated turnover less than AUD50 million from 2019 to 2020, and 80 percent or less of their assessable income was base-rate entity passive income (e.g. royalties and rent). Australia assesses corporate income taxes at the federal level rather than the regional level.



Reclamation

Reclamation and Mine Closure Plan Requirements

Reclamation of mine sites is both a state and a territory responsibility, and each has requirements to ensure that operators fulfil their obligations before relinquishing a mining lease, according to an Australian government mining official. This official also said the legislative frameworks in states and territories require all new mining projects to have specific plans detailing the ways mine closure and reclamation will occur, which are updated through the course of the mine life.

Bonding and Other Financial Assurance Requirements

State and territorial governments require operators to provide some form of financial surety (bond) before mining can begin, according to a Minerals Council of Australia document on mine reclamation, closure, and regulation. Furthermore, these funds are generally intended to cover the full third-party costs of reclaiming mine sites. This document also says that operators are required to provide cash bonds, unconditional financial institution guarantees, or nonrefundable contributions to pooled funds. Most commonly, a system of bonds (either cash bonds or bank guarantees) raised for individual mine sites is used as financial assurances, according to an Australian mining official.

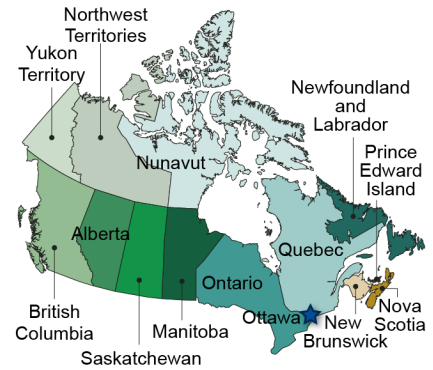


Malartic Mine, Quebec

Source: Natural Resources Canada. | GAO-21-298

Hardrock Mining in Canada

In 2018, Canada produced about \$38 billion of hardrock minerals, according to the World Mining Congress—a United Nations-affiliated organization. In 2018, Canada ranked in the top 10 countries for production of various hardrock minerals, such as platinum metals, according to the World Mining Congress.



Source: Map Resources. | GAO-21-298

Governance Structures for Managing Mining

Governance Structures and Mineral Ownership

Canada is a federation of 10 provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, Quebec, and Saskatchewan) and three territories (Northwest Territories, Nunavut, and Yukon). The federal, provincial, and territorial governments have individual and shared governing powers and responsibilities. These governments own the mineral rights and have authority over Crown lands—lands owned by the federal or provincial governments, according to a Canadian government mining official.

Mineral rights are almost exclusively under the administration and control of the provincial or territorial governments in which they reside, with the exception of resources on federal land; in offshore waters; or on the continental shelf, which fall under federal jurisdiction.

Indigenous groups generally have their own framework for mining on their lands, according to *The International Comparative Legal Guide to: Mining Law 2019* (legal guide). Further, the legal guide states that the Crown has a duty to consult and accommodate Indigenous communities' concerns before authorizing mining activities.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Canada generally provides open access, using a location system for individuals wanting to prospect for minerals on Crown lands that do not have any registered mineral claims, according to a Canadian government mining official. Prospecting involves staking a claim that needs to be registered and recorded and may precede exploration. Most jurisdictions now require a permit to be issued before they provide the operator an exclusive right to explore. Those wishing to explore for minerals that the Crown owns may need to obtain an exploration license in some jurisdictions, while in other jurisdictions one can conduct certain exploration activities without a license or other formal registration.

Duration and Land Area Limitations for Licenses or Claims

Duration limitations for exploration licenses and claims vary by jurisdiction. For example, in some jurisdictions, such as British Columbia, a mineral license is renewed indefinitely, according to the legal guide. This guide also states that, in other jurisdictions, a mineral exploration license is issued for a limited time, such as 10 years in the Northwest Territories and Nunavut, unless it has been converted into a mining lease. Some jurisdictions allow claims to be renewed if certain conditions are met. Land area limitations vary by jurisdiction. For instance, land area for a license can range in size from a minimum of 16 hectares (approximately 40 acres) to a maximum of 256 hectares (approximately 633 acres) in Ontario, whereas parcels range from a minimum of approximately 16 hectares to a maximum of 21 hectares (approximately 52 acres) in British Columbia.

Requirements for Keeping a License or Claim

Each year, an operator needs to undertake a minimum level of exploration work and file an assessment report describing the exploration and its costs, according to the legal guide. In addition, if the required exploration costs were not incurred, most jurisdictions would instead allow an operator to make a payment in lieu of performing exploration and development work.



Mine Development

Leasing

If mineral exploration is successful and an operator has met certain conditions, the operator generally needs to submit an application to obtain a mining lease from the relevant government to start mine development activities, according to a Canadian government mining official. A lease generally replaces a mineral license, except in Yukon, which allows operators to stake claims and use leases.

Other Required Approvals

The process to obtain leases requires several permits and authorizations from federal and provincial or territorial governments, including permits for health, safety, and waste management, according to a Canadian government mining official.

Assessing Environmental Impacts

The Impact Assessment Agency of Canada leads a national-level review of major resources projects—such as hardrock mining projects, according to a Canadian government document. The review is intended to foster sustainability, among other things.

The results of such reviews may require operators to conduct environmental impact assessments for mining projects. Additionally, government approval of the assessment is necessary before mine activity begins and is often required before most additional permits can be obtained from the regional government.

Multiple Minerals Covered by Leases

Whether leases may include multiple minerals varies by region. For example, British Columbia allows multiple

hardrock minerals to be included in a lease because it defines hardrock minerals broadly, according to the legal guide. A mining official in Canada said mining leases seldom restrict minerals that can be extracted.

Duration and Land Area Limitations for Leases

Leases range in duration between 10 and 30 years, depending on the jurisdiction, as stated by the legal guide. They are renewable if annual rent and mineral royalties are paid and operators comply with the terms and conditions of the lease and law. Certain jurisdictions have limitations on the number of allowed renewals.

Generally, the area of land allowed to be developed per mineral lease depends on its location. For example, Manitoba has a maximum limit of 800 hectares.

Requirements for Keeping a Lease

To maintain a lease, operators need to pay maintenance fees and mining taxes to the government that issued the lease, according to a 2020 *Mining in Canada: overview* by Thomson Reuters.



Mineral Production

Government Royalties or Taxes

Provinces and territories where mineral production and sales occur collect royalties, mining taxes, and corporate income taxes on hardrock mineral extraction, according to a Natural Resources Canada report on Mining Taxation in Canada and statements from a Canadian government tax official. Royalty structures and rates vary by jurisdiction and, in some cases, by mineral type.

There are three types of mining taxes: single-rate, two-tier, and escalating. A single-rate structure taxes all of the operator's profit at one rate. A two-tier structure applies one tax rate to operating income and a second, higher rate to any profit earned. An escalating structure applies variable rates that increase in proportion to income.

In addition, the Canadian federal government and provinces generally charge corporate income taxes on hardrock mineral extraction that range from 9 percent to 16 percent

Canada’s Hardrock Mining Royalty or Tax Rates, as of 2020

Jurisdiction	Royalty or tax rate (percent)			
	Single rate	First-tier rate	Second-tier rate	Escalating rate
Alberta		1 ^a	12	
British Columbia		2	13	
Manitoba				10-17
New Brunswick		2	16	
Newfoundland and Labrador		15	20	
Northwest Territories				5-14 ^b
Nova Scotia		2	15	
Nunavut				5-14 ^b
Ontario	10			
Quebec		1-4 ^c	16-22.9 ^d	
Saskatchewan				5-10 ^e
Yukon				3-12
Jurisdiction	Corporate income tax on hardrock mineral extraction (percent)			
Canadian federal government			15 ^f	
Provincial governments			9-16 ^g	

Source: GAO analysis of Canadian Mining documents. | GAO-21-298.

^aThe rate is applied to mine-mouth revenue, which is the gross value of minerals at the mine mouth and is calculated based on the value of the minerals at the mine, so any transportation cost or port costs are deducted.

^bRoyalty rate is based on an escalating formula, and the royalty payment is capped at 13 percent.

^cThe rate is applied to mine-mouth output value in excess of CAD80 million.

^dThe rate is applied to the annual profit.

^eRate is based on cumulative sales up to 1 million troy ounces of precious metals or 1 million metric tonnes of base metals. A troy ounce is a unit of measure used for weighing precious metals. A tonne is a metric measure equal to 1.102 short tons.

^fThe federal government assesses corporate income tax on mining income. Mining taxes and royalties paid to a province or territory are deductible in computing income for federal and provincial or territorial income tax purposes.

^gProvincial and territorial corporate income tax generally follows federal rules, according to a Canadian government mining official.



Reclamation

Reclamation and Mine Closure Plan Requirements

Canadian jurisdictions have mining legislation requiring the preparation and submission of mine closure and reclamation plans typically prior to mine approval, according to a Canadian government mining official. These plans must outline the reclamation and decommissioning steps that operators need to take upon cessation of mining activities.

Bonding and Other Financial Assurance Requirements

Financial assurance requirements vary across jurisdictions, both in terms of total amounts and acceptable forms. In general, financial assurances in Canada need to be in a specific and guaranteed form, such as cash; a letter of credit from a major Canadian bank; a bond from a guaranteed company approved under the relevant Insurance Act (e.g., Ontario Insurance Act); or a mining reclamation trust established under the federal Income Tax Act, according to a mining official.



Codelco's Andina Division, Valparaíso Region

Source: Mining Ministry of Chile. | GAO-21-298

Hardrock Mining in Chile

In 2018, Chile produced about \$46 billion of hardrock minerals, according to the World Mining Congress—a United Nations-affiliated organization. Chile contains 22 percent of the world's copper reserves and produced 28 percent of the world's copper as of 2019, according to a Chilean Ministry of Mining document.



Source: Map Resources. | GAO-21-298

Governance Structures for Managing Mining

Mineral Ownership and Governance Structures

All hardrock minerals are the property of the national government, according to our review of *The International Comparative Legal Guide to: Mining Law 2019* (legal guide), Chilean mining documents, and interviews with Chilean mining officials. Mineral exploration and extraction may occur on Indigenous peoples' land, but the National Corporation for Indigenous Development needs to provide easements and approvals before mining activities occur. In addition, consultations with Indigenous populations may be required during the environmental assessment process.

The framework for managing hardrock mining is stated in the Chilean Constitution, national law, and code. The national courts and five regulatory agencies oversee hardrock mining, according to Chilean mining officials and government documents.

- The Tribunal Courts grant permits and leases.
- The Ministry of Mining develops mining policy and principles.
- The National Service for Geology and Mining (SERNAGEOMIN) is responsible for mine safety, closure, and reclamation, as well as conducting geological surveys and developing maps.
- The Environmental Evaluation Service implements environmental regulations.
- The Environmental Superintendence regulates environmental projects.
- Lastly, the Chilean Copper Commission—an office within the Ministry—provides mining technical advice, monitors the price of copper and other minerals, and oversees the National Copper Corporation of Chile—a nationally owned mining company.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

An operator needs to obtain a permit through the national judicial system to explore for minerals, according to Chilean mining officials and SERNAGEOMIN's guide to exploration and mining leases (which is based on mining code).

Acquiring a Permit

An operator seeking an exploration permit needs to file an online petition to the tribunal court in the region where the minerals are located, based on our review of a SERNAGEOMIN mining guide on mineral leases (referred to as mineral concessions) for exploration and development. The judge may send the petition to SERNAGEOMIN for a technical review. After an operator fulfills several requirements, the judge grants the exploration permit. After the judge grants the permit, the operator needs to publish the petition in a local and national publication and register it with the local recorder of mines.

Duration and Land Area Limitations for Permits

The permit duration is 2 years, which can be extended for an additional 2 years. However, the operator needs to relinquish half of the original area back to the government when the duration is extended, according to statements from Chilean mining officials and our review of the legal guide. The land areas covered by exploration permits can range from 100 hectares to 5,000 hectares (approximately 247 acres to about 12,355 acres), and the areas are polygons.

Requirements for Keeping a Permit

The operator is not required to mine but needs to pay an annual fixed rental fee, according to the legal guide and Chilean mining officials. If fees are not paid, the General Treasury of the Republic can auction the permit.



Mine Development

Leasing

If operators want to further develop the minerals after receiving an exploration permit, they then need to file an online petition with the tribunal court closest to the point of interest, according to a SERNAGEOMIN guide to exploration and mining. The operator, with the assistance of a civil engineer, presents the measurements of the mine and requests the lease from the judge. To ensure that no others have mineral rights for the point of interest, the operator publishes the scope of the lease in a local bulletin.

Once a judge determines that requirements have been met and there are no other claims on the point of interest, the lease is granted. Afterward, to help inform the public, the operator publishes the petition in a local and national publication and registers the lease with the local recorder of mines.

Other Required Approvals

In addition to mining leases, environmental licenses, easements, and other approvals are required, such as those for building and safety, as stated by Chilean documents and mining officials.

Assessing Environmental Impacts

Each mining operation must comply with environmental requirements, according to the legal guide and Chilean mining officials. If mineral extraction is more than 5,000 tonnes per month, the mining operation will need to undergo an environmental impact assessment conducted by the Environmental Evaluation Service, which also includes public participation. If the proposed mining operations will result in a relevant impact to the environment, then the operator will need to adjust the type and size of operations to mitigate the damages.

Multiple Minerals Covered by Leases

Mining permits and leases can cover all hardrock minerals except for lithium, according to Chilean mining officials.

Duration and Land Area Limitations for Leases

Leases are indefinite, as long as the operator pays annual fees, as indicated by Chilean mining officials and our review of the legal guide. The land area for mine development leases is limited to less than 100 hectares.

Requirements for Keeping a Lease

An operator is not required to mine to keep a lease but needs to pay an annual fixed rental fee, according to the legal guide.



Mineral Production

Government Royalties or Taxes

The national government collects a special mining income tax calculated using the operational revenue of a mine, according to the Ministry of Economy, Development, and Tourism Foreign Investor's Guide. This tax has a progressive rate, depending on the annual mineral sales of a mine. Further, a corporate income tax on hardrock mineral extraction is applied on profits, after paying the special mining income tax.

Chile's Hardrock Mining and Corporate Income Taxes, as of 2020

Special mining income tax	Annual sales of copper	Tax rate (percent)
	Up to the value of 12,000 metric tonnes ^a	No tax
	12,000 to 50,000 metric tonnes	0.5 to 4.5
	Over 50,000 metric tonnes	5 to 14

Corporate income tax	Annual	Tax rate (percent)
	Tax on operators' income	27
	Tax on dividends and operators' profits	35

Source: GAO analysis of Chilean Ministry of Economy, Development, and Tourism's guide. | GAO-21-298.

^aThe value of 1 metric tonne of fine copper is determined according to the Grade A copper spot price average value for the respective fiscal year on the London Metal Exchange. The Chilean Copper Commission publishes this price within the first 30 days of each year.



Reclamation

Reclamation and Mine Closure Plan Requirements

All operators need to submit a mine closure plan to SERNAGEOMIN, as stated by Chilean government mining officials. The plan establishes the technical activities that operators need to carry out from the beginning of operations until the mines close. These activities include

ensuring that the mine site is chemically and physically stable.

Periodically, the mine closure plan is updated during exploration and mine development. Because SERNAGEOMIN is responsible for executing postmine closure activities, the operator is released from all liabilities and pays SERNAGEOMIN the mine closure cost.

Bonding and Other Financial Assurance Requirements

Reclamation bonds are required to ensure that operators fulfill their obligations. Operators need to cover the costs of mine closure plan implementation and postclosure monitoring, as stated by a 2019 document from a Chilean law firm. Operators pay financial assurances to SERNAGEOMIN in installments generally within the first two-thirds of each project's lifespan.

Appendix IV: Governance Structures and Approaches That 11 Western U.S. States Use to Manage Hardrock Mining

This appendix provides individual summaries of the governance structures and approaches that 11 western states use to manage hardrock mining on state-owned lands—primarily trust lands.¹ The states we selected for our review were Alaska, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming. Because of the ways the federal government granted lands to these states, some states' lands are treated differently than others and are referred to differently. These summaries are based on state government documents, interviews with some state officials when we needed further clarification, and other publicly available information.

Each state's summary includes

- a description of land ownership, such as the amount of state-owned acres,² as well as hardrock mining governance structures, such as government agencies and commissions that manage hardrock mining on state-owned lands, including trust lands; and
- a description of the state's mining approaches organized by the four primary stages of hardrock mining:
 - **Mineral exploration.** This section describes aspects of mining, such as the ways operators acquire legal rights to prospect, explore, and mine, as well as requirements for staking a claim or applying for permits and leases.
 - **Mine development.** This section describes whether environmental reviews are required, as well as the approaches for developing mines, which primarily includes the lease acquisition

¹State-owned lands include different types of land, such as state parks and trust lands. For nine of the 11 selected states, we discuss hardrock mining approaches used on state trust lands. For Alaska and California, we discuss mining on state-owned land that does not include trust lands. In Alaska, most mining occurs on its state-owned lands that do not include trust lands. In California, the state found that neither its enabling act nor its Constitution impose trust responsibilities over township sections, which are referred to as "school lands." As a result, we discuss mining on school lands rather than trust lands. See Peter W. Culp et al., *State Trust Lands in the West: Fiduciary Duty in a Changing Landscape, Updated* (Cambridge, MA: Lincoln Institute of Land Policy, 2015), 11.

²The U.S. Geological Survey Gap Analysis Project, 2018 Protected Database of the U.S., provides total state-owned acres but does not separate the acreage by land types, such as by trust lands or state parks.

processes and lease limitations, which are established before operators can begin constructing the mine site.

- **Mineral production.** This section summarizes the royalties and taxes that governments may collect on the minerals that operators extract, depending on the type of approach used.³ The royalties are generally based on (1) the unit (assessed on the quantity or weight of minerals produced), (2) gross revenue (assessed as a percentage of the value of minerals extracted), (3) net smelter returns (assessed as a percentage of the value of minerals produced with deductions for processing), or (4) net proceeds (assessed as a percentage of the net proceeds or profit of the sale of the minerals).⁴ Examples of tax types include (1) severance taxes (a tax or fee imposed on the extraction of natural resources), (2) mine license taxes (a tax assessed in conjunction with a mine license for the privilege of mining), and (3) resource excise taxes (a tax imposed on the extracting or processing of natural resources).

In these summaries, “paying quantities” generally means that operators are producing enough of a mineral to cover their costs and make a profit.

- **Reclamation.** This section explains whether reclamation and mine closure plans—that may discuss topics such as the ways operators will reshape and revegetate disturbed areas—are required. It also summarizes various financial assurance requirements, such as the amount and types accepted.

³For more detailed information, see GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, B-330854 (Washington, D.C.: July 16, 2019). Royalties and taxes are part of a broader mining fiscal regime. Most taxes, such as capital gains taxes, as well as rents and fees, were outside the scope of this review.

⁴In some cases, a royalty or tax generally fits into one of these four categories but with some differences. We identify these royalties or taxes as a “modified” version of the most similar category.

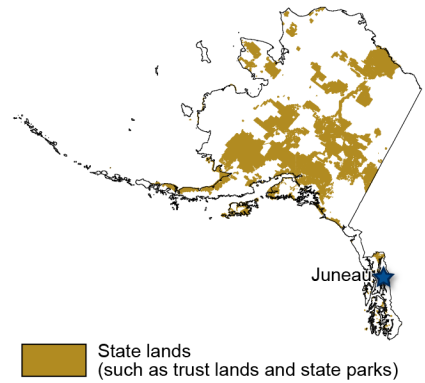


Pogo Mine in southwest Alaska

Source: Alaska Department of Natural Resources. | GAO-21-298

Hardrock Mining on Alaska State Lands

Some of Alaska's principal minerals include gold, lead, silver, and zinc, according to a Mineral Commodity Summaries 2019 report from the U.S. Geological Survey (USGS). The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Alaska was approximately \$3.4 million in 2019.



Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Alaska became a state in 1959, and the 1959 Alaska Statehood Act authorized a land transfer to the state of approximately 110 million acres, to be selected by the state. Unlike federal laws granting land to some other states, the Alaska Statehood Act, although it did specify some uses of land, did not stipulate specific township sections to be held in trust to benefit public institutions.

As of 2018, Alaska had approximately 94 million acres of state-owned lands, according to USGS and Census Bureau data, after having sold about 16 million acres since 1959. About 1 million of the 94 million acres were trust lands. Alaska uses the location system on its state-owned lands that do not include trust lands and uses a leasing system on its trust lands. The following discussion covers hardrock mining on the 93 million acres of state-owned land that does not include trust lands.

The Division of Mining Land and Water, under the Alaska Department of Natural Resources, is responsible for managing and overseeing hardrock mining on state-owned land that does not include trust lands.

The Alaska Minerals Commission (Commission), within the Alaska Department of Commerce, Community, and Economic Development, is responsible for making annual recommendations to the Governor on ways to mitigate constraints on mineral development in the state. The Commission is composed of 11 members (five appointed by the governor, three appointed by the President of the Senate, and three appointed by the Speaker of the House of Representatives) for staggered terms of 3 years.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Mining rights on state-owned land that does not include trust lands are acquired by locating or prospecting a mine site, similar to staking a mining claim on federal lands. (See app. I for information on mining on federal lands.) There is generally nonexclusive access to state-owned land that does not include trust lands for prospecting and an exclusive right of possession and extraction under a claim or a lease.

Acquiring a Permit

For state-owned lands that do not include trust lands, there is no requirement for an operator to obtain an exploration permit if the planned exploration is low intensity, such as operating with a pick, shovel, or a backpack drill, according to Alaska mining officials. However, to explore with mechanized equipment, the operator must first obtain a multistate agency permit.

Duration and Acreage Limitations

For state-owned land that does not include trust lands, exploration permits for prospecting sites are issued in 160-acre (quarter square mile) or 40-acre (quarter-quarter square mile) sections for 2 years.



Mine Development

Acquiring Mineral Rights

After minerals are discovered, the operator can obtain a mining claim by marking the claim, posting a location notice, recording a certificate of location in the recording district where the claim is situated, and paying a rental fee. Mining claims on state-owned land that does not include

trust lands give an operator the exclusive right to possession and extraction of minerals.

A claim must be converted to a mining lease before mining operations can begin on state-owned land that does not include trust lands if

- there may be other valuable resources present;
- the surface has already been leased or sold for other uses; or
- operators decide to conduct advanced exploration that includes things such as building permanent structures or storing waste rock, according to Alaska mining officials and a website.

Before proceeding with mine development, a plan of operations must be approved by the Division of Mining, Land, and Water. The plan of operations may be issued for up to 10 years.

Other Required Approvals

Federal, state, and local government approvals may be required, such as those related to air quality, wildlife, fishery and habitat quality, hazardous materials and waste, safety, and water quality.

Assessing Environmental Impacts

The operator may be required to conduct an environmental review as part of the permitting process.

Multiple Minerals Covered by Leases

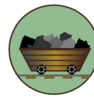
State mining claims and leases do not differentiate among hardrock minerals; they authorize recovery of all hardrock minerals.

Lease Term and Acreage Limitations

For state-owned land that does not include trust lands, mineral leases can be up to 55 years and are renewable if requirements for the leases remain satisfied. A mining claim remains active if all the requirements remain satisfied as long as the operator has paid the annual rent and royalties.

Requirements for Keeping a Claim or Lease

In addition to paying annual rental fees, the operator needs to perform labor or improvements annually on, or for the benefit or development of, each mining claim and leasehold location on state-owned land that does not include trust lands. Instead of performing annual labor, the holder of a claim or leasehold location may make a cash payment to the state equal to the value of the labor required, for not more than 5 consecutive years.



Mineral Production

Government Royalties or Taxes

As of July 2019, Alaska was assessing a production royalty on all minerals extracted from state land at a rate of 3 percent of net income, and a mining license tax for certain minerals, which ranged from 3 percent to 7 percent based on the operator's net income. New operations were exempted from the mining license tax for 3.5 years after production begins. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, B-330854 (Washington, D.C.: July 16, 2019) for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan requirements

Operators are required to submit a reclamation plan that establishes the steps that will be taken to reclaim the mine site and that estimates the associated costs to implement the approved reclamation plan. The operator may not engage in mining operations until the Commissioner of Natural Resources has approved the plans. The operator is required to amend the plan to reflect changes in the scope of activities and costs. The plan is renewed on a regular basis.

Bonding and Other Financial Assurance Requirements

Bonding is required to ensure that sufficient funds will be available for reclamation, and the amount is \$750 per acre or can be reduced to an amount determined by the Commissioner based on several factors, including the degree of risk involved in the mining operation. After a multiyear reclamation plan goes into effect, the operator is to ensure that the bond amount is sufficient at all times to cover any area to be mined during the current calendar year, plus any area mined in a previous year that has not yet been reclaimed.

Common financial assurances, such as cash, letters of credit, and certificates of deposit, are accepted. In addition, gold is accepted. As an alternative to these assurances, some operators may be able to participate in a state bonding pool.

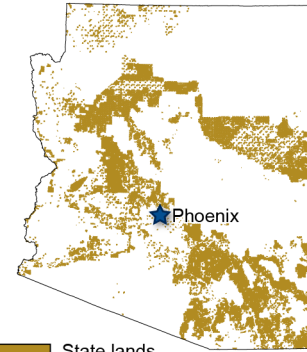


Mission Complex Mine in southern Arizona

Source: Arizona State Land Department. | GAO-21-298

Hardrock Mining on Arizona State Trust Lands

Some of Arizona’s principal minerals include raw materials for cement, copper, molybdenum concentrates, and stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Arizona was approximately \$6.7 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Arizona became a state in 1912, and federal law stipulated that Arizona receive township sections 2, 16, 32, and 36 to benefit schools (see fig. 3). State-owned land, including trust lands, comprise approximately 9.4 million acres, according to 2018 USGS and U.S. Census Bureau data.

The Land Commissioner oversees the Arizona State Land Department, which manages hardrock mining on state trust lands. Additionally, the Arizona State Mine Inspector—an elected position—is responsible for inspecting the operation and safety of active and inactive mines. The Reclamation Division, under the State Mine Inspector, is responsible for reviewing reclamation plans for mined land and recommending the plans to the State Mine Inspector or denying them. The following discussion covers hardrock mining on state trust lands.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

A permit is required to obtain the exclusive rights to explore for hardrock minerals, according to a state mining official.

Acquiring a Permit

An operator must apply for a permit from the Arizona State Land Department, according to a state mining official.

Assessing Environmental Impacts

An environmental review is required to identify potential environmental impacts, such as causing erosion, from the mining operation on topics such as land use, according to an Arizona State Land Department document. The review also needs to identify ways to mitigate any impacts.

Permit Duration and Acreage Limitations

The permit term is 1 year and can be renewed annually for 4 additional years (a total of 5 years). Exploration can occur on no less than 20 acres but not more than 640 acres (1 square mile), according to a state mining official.



Mine Development

Leasing

Following discovery of a valuable mineral deposit on land covered by an exploration permit, an operator may apply for a mineral lease. Upon receipt of an application for a mineral lease, and satisfactory proof of mineral discovery, the Land Commissioner is to issue a lease.

Other Required Approvals

Federal, state, and local government approvals may also be required for mine development, such as permits related to hazardous materials and waste, safety, and water quality.

Multiple Minerals Covered by Leases

Mineral leases may include more than one mineral, according to a state mining official.

Lease Term and Acreage Limitations

An initial mineral lease term is 20 years, and the operator has the preferred right to extend the lease in 20-year increments.

Leases may not be for fewer than 20 acres. However, unlike for exploration, leases can also be for areas larger than 640 acres, by prior agreement, if the acreage is contiguous, according to state mining official.

Requirements for Keeping a Lease

Rent and royalties must be paid, and the operator must comply with the lease terms.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate was based on gross revenue and calculated using a reference price such as the price of the mineral traded in a commodities exchange (e.g., the New York Mercantile Exchange). The rate was at least 2 percent of gross revenue of all produced and sold minerals. The severance tax rate on metallic minerals was 2.5 percent of the net severance base, which is 50 percent of the difference between the gross value of production and the production costs. The transaction privilege tax—mining classification—was 3.125 percent and was based on gross proceeds of sales or gross income derived from the business. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

A reclamation plan is required. An operator with an approved reclamation plan must annually submit a status report for the preceding year to the State Mine Inspector within 60 days after the anniversary of the approval of the reclamation plan.

Bonding and Other Financial Assurance Requirements

Bonding is required, and the amount is determined based on the estimated costs of reclamation. Financial assurances can be paid in an incremental basis, but the amount must be equal to or greater than the estimated cost of reclamation for surface disturbances created during that increment. Common financial assurances are accepted, such as surety bonds, certificates of deposit, trust funds, letters of credit, and insurance.



Black Angel Mine in southern California

Source: California State Land Commission. | GAO-21-298

Hardrock Mining on California School Lands

Some of California's principal minerals include boron, raw materials for cement, gold, and stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in California was approximately \$4.6 billion in 2018.



State lands (such as school lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

California became a state in 1850, and federal law stipulated that California receive township sections 16 and 36 (see fig. 3). However, the state found that neither its enabling act nor its Constitution impose trust responsibilities over these township sections, which are known as “school lands”, according to a 2015 Lincoln Institute of Land Policy report. State-owned lands comprise approximately 3.2 million acres, including school lands, according to 2018 USGS and U.S. Census Bureau data.

The California State Lands Commission (Commission) and its Land Management and Mineral Resources Management Divisions oversee and manage leasing of state school lands, including for mining. Other state agencies also play a role in managing mining:

- The Division of Mine Reclamation, within the Department of Conservation, oversees local governments as they administer the Surface Mining and Reclamation Act within their respective jurisdictions.
- The State Mining and Geology Board regulates seismologic hazards, conservation of minerals, and reclamation of mined lands.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Simple hand-sampling and mapping exploration projects are authorized under geological survey permits, according to a state mining official. When extraction is planned, operators must obtain prospecting permits, which provide the exclusive right to locate minerals on school lands that are dedicated to public use and not known to contain valuable minerals.

Acquiring a Permit

To obtain a prospecting permit, an operator must apply to the Commission. Upon the discovery of commercially viable minerals, the operator is entitled to a preferential lease.

Permit Duration and Acreage Limitations

Initially, prospecting permits are issued for 2 years for projects that include drilling. One extension may be granted for a total term that cannot exceed 3 years. Permits typically are issued for 640 acres (1 square mile), according to a state mining official.



Mine Development

Leasing

A lease is required for operators to mine on school lands known to contain valuable minerals. For land that is classified as containing valuable mineral deposits, the

Commission may issue a lease by competitive bid to the highest qualified and responsible bidder. For some types of lands, the Commission may issue a negotiated lease.

Other Required Approvals

Federal, state, and local government approvals may be required for mine development, such as permits related to air quality, hazardous materials and waste, safety, and water quality.

Assessing Environmental Impacts

California law generally requires an evaluation of the potential environmental effects of discretionary projects approved, including mineral development projects, by a public agency.

Multiple Minerals Covered by Leases

Leases can cover multiple hardrock minerals, according to a state mining official.

Lease Term and Acreage Limitations

Leases are issued for a term not to exceed 20 years. Operators have the preferential right to renew their leases for successive terms not to exceed 10 years each. Leases are for a maximum of 960 acres.

Requirements for Keeping a Lease

An operator must submit a yearly statement to the Commission discussing the work performed on the leased area and the amount, quality, and value of all minerals produced, shipped, or sold during the calendar year.



Mineral Production

Government Royalties or Taxes

As of July 2019, production royalty rates were based on either the net smelter returns or net proceeds, or were lease specific. The rate was not less than 10 percent of gross value of all mineral production. Fees on gold and silver were unit based, at \$5 per ounce of gold and \$0.10 per ounce of silver, with a minimum of \$100 and a maximum of \$10,000 annually. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators must complete reclamation plans and have them approved by a lead agency, such as the Planning and Building Department, in the county where the mine site is located, according to state mining officials. These

officials said that the Division of Mine Reclamation under the Department of Conservation reviews proposed reclamation plans, plan amendments, and financial assurances. It also confirms completion of reclamation plans before releasing the operator’s financial assurances.

Bonding and Other Financial Assurance Requirements

Financial assurance, such as bonding, is required, and the amount is set based on the estimated cost of adequate actions to perform reclamation in accordance with the mine’s reclamation plan. On an annual basis, the cost estimate must be reviewed and, if necessary, adjusted to account for new lands disturbed by surface mining operations, inflation, and reclamation of lands accomplished, in accordance with the approved reclamation plan.

Common financial assurances are accepted, such as surety bonds, irrevocable letters of credit, or trust funds. In addition, financial assurances may also include the operator participating in a bonding pool program.

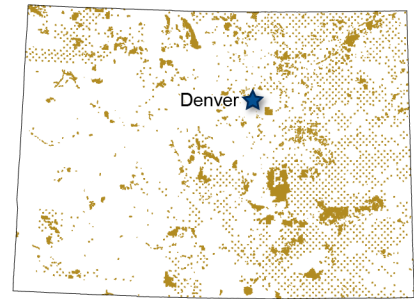


Colorado State land in central Colorado

Source: GAO. | GAO-21-298

Hardrock Mining on Colorado State Trust Lands

Some of Colorado's principal minerals include the raw materials for cement, gold, molybdenum concentrates, and stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Colorado was approximately \$1.4 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Colorado became a state in 1876, and federal law stipulated that Colorado receive township sections 16 and 36 to benefit schools (see fig. 3). State-owned land, including trust lands, comprise approximately 3.4 million acres, according to 2018 USGS and U.S. Census Bureau data. The majority of the mining activity on state-owned lands is conducted on state trust lands, according to Colorado mining officials. The following discussion covers hardrock mining on state trust lands.

The Colorado State Board of Land Commissioners (Colorado State Land Board) manages and leases state trust lands. Five persons who are appointed by the Governor comprise this board. The Governor is to endeavor to appoint members who reside in different regions of the state. One member is to have substantial experience in each of the following areas: production agriculture, public primary or secondary education, local government and land use planning, and natural resource conservation.

The Colorado Division of Reclamation, Mining and Safety (CDRMS) within the Department of Natural Resources reviews mining and reclamation permit applications and inspects mining operations to make sure that reclamation plans are followed.

The Colorado Mined Land Reclamation Board establishes the regulations, standards, and policies that guide the CDRMS. The seven-member board includes five multi-interest citizens appointed by the Governor and confirmed by the State Senate for a term of 4 years.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

The Colorado State Board of Land Commissioners requires an exploration lease to explore on state trust lands, according to a state mining official. The leases are granted for a specific amount of time, mineral, and exploration methods. The Colorado State Land Board places property- and activity-specific stipulations on the leases on a case-by-case basis.

Acquiring a Permit

The CDRMS approves applications for exploration permits after review, and the operator presents a performance bond.

Permit Duration and Acreage Limitations

There are no overall maximum permit duration or acreage limitations set on exploration activities, according to a state mining official.



Mine Development

Leasing

The Colorado State Board of Land Commissioners issues leases for hardrock mining on state trust lands. The Colorado State Land Board issues leases either through a competitive bid or direct negotiation, depending on the mineral.

Other Required Approvals

Federal, state, and local government approvals may be required, such as permits related to air quality, safety, and water quality.

Assessing Environmental Impacts

Operators must complete an environmental analysis regarding mining activities' impact on water, wildlife, and vegetation, according to a Colorado Mined Land Reclamation Board document.

Multiple Minerals Covered by Leases

Multiple hardrock mineral types can be extracted under a lease.

Lease Term and Acreage Limitations

A mining lease is generally for 5 to 20 years, according to a state mining official. However, some leases can continue in effect as long as the operator is paying annual rent and royalties. There are no acreage limitations set on development activities.

Requirements for Keeping a Lease

All operators must pay annual rent to retain a lease. Some leases require an operator to make an advance payment of royalties based on an amount of mineral production per acre or estimated production volumes, according to a state mining official.



Mineral Production

Government Royalties or Taxes

As of July 2019, the Colorado State Board of Land Commissioners set the royalty rates for mining on state trust lands. These rates were specific to each lease.

Colorado also levied a severance tax on all metallic minerals extracted in the state, which was based on modified gross revenue at a rate of 2.25 percent on the amount of gross income exceeding \$19 million. Additionally, there is a severance tax rate on molybdenum, which was unit based at \$0.05 per ton above 625,000 tons per calendar quarter. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators must develop a reclamation plan before mining operations can begin. A reclamation permit must be issued by CDRMS prior to any exploration and mining activity.

Bonding and Other Financial Assurance Requirements

Operators need to provide financial assurances to CDRMS prior to receiving an exploration or mining permit. The amount is specific to the mining site and determined by a software program for estimating standardized reclamation costs.

As necessary to ensure adequacy of the financial assurance, the Colorado Mined Land Reclamation Board may adjust the amount of the required financial assurance, for example, in response to an annual status report that the operator must submit. Common financial assurances are accepted, such as letters of credit, corporate sureties, and cash bonds.

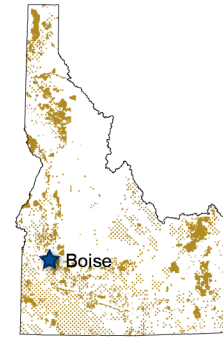


Thompson Creek Mine in central Idaho

Source: Idaho Geological Survey. | GAO-21-298

Hardrock Mining on Idaho State Trust Lands

Some of Idaho's principal minerals include lead, phosphate rock, and stone, according to a Mineral Commodity Summaries 2019 report from the U.S. Geological Survey (USGS). The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Idaho was approximately \$208 million in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Idaho became a state in 1890, and federal law stipulated that Idaho receive township sections 16 and 36 to benefit schools (see fig. 3). State-owned lands, including trust lands, comprise approximately 3 million acres, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

The five-member Idaho State Board of Land Commissioners provides direction to the Idaho Department of Lands' Real Estate Bureau. This bureau administers hardrock mineral leases. The Idaho Department of Lands' Resource Protection and Assistance Bureau (bureau) oversees mine operations; permitting; and reclamation of mined lands, including state-owned land such as trust lands.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

An operator may obtain the exclusive right to explore for minerals on state trust lands by obtaining an exploration location permit, according to a state mining official.

Acquiring a Permit

An operator needs to submit an application for an exploration location permit to the Department of Lands Board for approval, according to a state mining official.

Permit Duration and Acreage Limitations

Exploration location permits are issued for a maximum of 2 years and cannot be renewed, according to a state mining official. This official noted these permits are generally for a maximum of 20 acres.

Requirements for Keeping a Permit

The operator needs to perform \$100 worth of excavation or development work annually and submit documentation of this work to the state.



Mine Development

Leasing

If minerals are discovered, an operator must apply for and obtain a mineral lease from the Idaho Department of Lands through a public auction process before beginning mining operations, according to a state mining official. This official also said that obtaining an exploration permit guarantees the award of a mineral lease through a public auction process. Additionally, the operator must submit and receive approval of a mine plan from the Idaho Department of Lands.

Other Required Approvals

Federal, state, and local government approvals may be required, such as permits related to safety and water quality.

Assessing Environmental Impacts

Environmental reviews are not required for exploration activities or mine development, according to a state mining official.

Multiple Minerals Covered by Leases

Mining permits and leases can cover multiple hardrock minerals, according to a state mining official.

Lease Term and Acreage Limitations

The initial mineral lease term may be up to 20 years and can be extended. Leases are for a maximum of 640 acres, according to a state mining official.

Requirements for Keeping a Lease

Leases will be continued if the operator produces minerals in paying quantities or meets other state law requirements.

Common financial assurances are accepted, such as letters of credit, corporate surety bonds and guarantees, and trust funds, but real property is accepted as well.



Mineral Production

Government Royalties or Taxes

As of 2019, the royalty rate was based on net smelter returns for hardrock mineral leases or gross revenue of riverbed mineral leases, both with a rate of 5 percent of the value of mineral produced and saved. The mining license tax was based on net proceeds, and the rate was 1 percent of net value of royalties paid or ore mined or extracted. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators need to submit a reclamation plan for approval with the Idaho Department of Lands' Resource Protection and Assistance Bureau before mining operations can begin.

Bonding and Other Financial Assurance Requirements

Financial assurance of \$5,000 is required upon lease execution, and the Department of Lands and the operator agree at the time of mine plan approval on the adjusted financial assurance amount for the next 12 months, according to a bureau document. If the operator plans to disturb additional acreage in subsequent years, an increase in the financial assurance will be required.

The amount of financial assurance for operations with 5 or fewer disturbed acres generally ranges from \$5,000 to \$15,000 per disturbed acre. For operations with more than 5 disturbed acres, the cost is based on the reclamation required under the reclamation plan, including indirect costs.

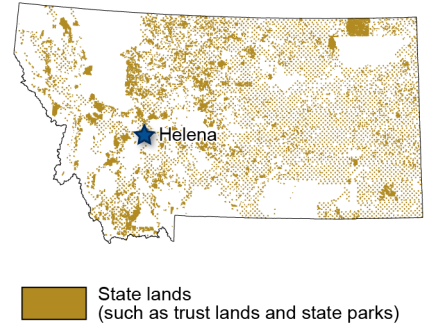


Montana tunnels in central Montana

Source: Montana Department of Environmental Quality. | GAO-21-298

Hardrock Mining on Montana State Trust Lands

Some of Montana's principal minerals include cement, copper, palladium metal, and platinum metal, according to a Mineral Commodity Summaries 2019 report from the U.S. Geological Survey (USGS). The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Montana was approximately \$1.1 billion in 2018.



Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Montana became a state in 1889, and federal law stipulated that Montana receive township sections 16 and 36 to benefit schools (see fig. 3). State-owned lands, including trust lands, comprise approximately 5.7 million acres, according to 2018 USGS and U.S. Census Bureau data. The majority of the mining activity on state-owned land is conducted on state trust lands, according to a Montana mining official. The following discussion covers hardrock mining on state trust lands.

The five-member State Board of Land Commissioners (board) and the Trust Land Management Division within the Montana Department of Natural Resources and Conservation (MDNRC) administer and manage the state's mineral resources.

The Montana Department of Environmental Quality (MDEQ) reviews operating permit applications, exploration license applications, and conducts corresponding inspections in its application of the Metal Mine Reclamation Act.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

A land use license from MDNRC's Trust Land Management Division gives an operator the right to prospect (explore) for a specific mineral on that tract of

trust land. An operator also needs to acquire an exploration license from MDEQ.

Acquiring a License

An operator needs to submit an application for a land use license to the State Land Board for approval for both nonmechanized and mechanized exploration, according to an MDNRC official. An operator also needs to submit an application for an exploration license from MDEQ, along with an exploration plan of operations and a fee, and meet other criteria.

License Term and Acreage Limitations

Land use licenses are issued for a duration deemed necessary for exploration activities by the MDNRC but are not to exceed 10 years, according to an MDNRC official. Exploration licenses from MDEQ must be renewed annually. There are no acreage limitations.



Mine Development

Leasing

Before the board issues a lease, it investigates the character of the trust lands and the nature and possible extent of the mineral deposits to determine (1) whether the land should be leased and (2) the royalty and rental fee rates. An operator submits a lease application to the board.

Other Required Approvals

Federal, state, and local government approvals may be required, such as permits related to hazardous materials and waste, operations, safety, and water quality.

Assessing Environmental Impacts

An environmental review under the Montana Environmental Policy Act (MEPA) could be required whenever a state action is taken that may have an impact on the human environment, according to an MDEQ official.

The type of MEPA review depends on whether or not impacts from a proposal are significant. Smaller hardrock mine proposals may result in minor impacts for which an environmental assessment shows a full environmental impact statement is not necessary. Larger hardrock mines often necessitate an environmental impact statement because the proposed action is a major action significantly affecting the quality of the human environment.

Multiple Minerals Covered by Leases

Generally, mineral leases are for one mineral; however, if other minerals are found marketable, they can be included in the lease, according to an MDNRC official.

Lease Term and Acreage Limitation

A mining lease is generally for 10 years and can be renewed. The board determines the number of acres granted per lease.

Requirements for Keeping a Lease

Operators can keep a lease as long as minerals are being produced in paying quantities and operators are fulfilling all obligations, including payment of royalties and rents.

after certain actions, if the MDEQ determines that an increase of the bond level may be necessary. Common forms of financial assurances are accepted, such as cash, certificates of deposit, and irrevocable letters of credit.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate for metalliferous mines was based on net smelter returns, ranging from 5 percent to 8 percent of returns. The mining license tax for metal mines was based on net smelter returns and was a percentage of gross value, ranging from 1.6 percent to 1.81 percent. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators are required to submit a reclamation plan. Trust lands affected by mining activity must be reclaimed to a condition specified by state law; for example, disturbed land other than open pits and rock faces must be reclaimed to comparable utility and stability as that of adjacent areas.

Bonding and Other Financial Assurance Requirements

Bonding is required, and the MDEQ sets the amount, which cannot be less than \$200 for each acre or fraction of the disturbed land. The MDEQ is to conduct an overview of the amount of each bond annually. It is also to conduct a comprehensive bond review at least every 5 years, or

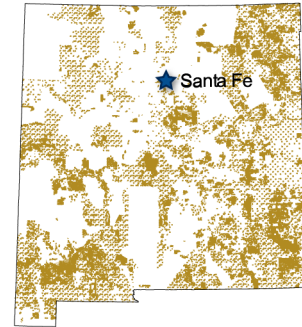


Geodes lease in southwest New Mexico

Source: New Mexico State Land Office. | GAO-21-298

Hardrock Mining on New Mexico State Trust Lands

Some of New Mexico's principal minerals include copper, potash, cement, and stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in New Mexico was approximately \$1.2 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

New Mexico became a state in 1912, and federal law stipulated that New Mexico receive township sections 2, 16, 32, and 36 for the support of free public nonsectarian schools (see fig. 3). New Mexico owns approximately 9.1 million acres of state land, including trust lands, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

The State Land Office and Oil, Gas, and Minerals Division of the New Mexico State Land Office (State Land Office) are responsible for, among other things, lease sales and all aspects of lease administration.

A Land Trust Advisory Board (board) assists the Commissioner of Public Lands in developing policies and programs. The board is composed of seven members appointed by the Commissioner and confirmed by the State Senate for a term of 6 years.

The mission of the New Mexico Mining and Minerals Division (Division) within the Energy, Minerals, and Natural Resources Department is to ensure the responsible utilization, conservation, reclamation, and safeguarding of state-owned land, including trust lands, and resources affected by mining.

The New Mexico Mining Commission was created in the 1993 New Mexico Mining Act as the rulemaking and administrative review body for the act. The Commission consists of seven members, which are designated in the New Mexico Mining Act.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Generally, a lease must be obtained from the State Land Office to explore for minerals. Operators may be able to conduct nondestructive geophysical exploration with a permit from the State Land Office; however, when operators want to drill holes, they need a lease, according to an official with the State Land Office. In addition, operators need to apply to the Mining and Minerals Division for an exploration permit.

Acquiring a Permit or Lease

Typically, operators obtain a mineral lease prior to exploration and mine development. The leasing process includes the following steps:

1. The State Land Office conducts a public auction at which bidders compete for a mineral lease by seeking to offer the highest bonus.
2. The highest bidder submits a disclosure statement to the State Land Office.
3. Unless the Commissioner declares the sale void or withdraws the subject area from general mining, the Commissioner and the highest bidder enter into a mineral lease.

Permit or Lease Duration and Acreage Limitations

A permit to conduct exploration cannot be issued for a period of more than 1 year from the date of issuance and is renewable from year to year upon application. There are no surface acreage limitations set on exploration activities.

Assessing Environmental Impacts

Environmental impacts are typically evaluated on a limited basis during exploration because of limited ground disturbance. If minerals are discovered during exploration, the operator applies for a mining permit. During this process, an environmental review will be conducted.

All leases require compliance with all environmental laws applicable in the state of New Mexico, including those administered by the New Mexico Environment Department, along with any federal and regional laws.



Mine Development

Leasing

Typically, the lease that operators obtain from the State Land Office during exploration also covers mine development.

Other Required Approvals

Federal, state, and local government approvals may be required, such as permits related to hazardous materials and waste, safety, and water quality.

Multiple Minerals Covered by Leases

Multiple hardrock mineral types can be extracted using one lease.

Lease Term and Acreage Limitations

Leases are initially issued for a primary term of 3 years. If minerals are not extracted in paying quantities, the leaseholder may continue the lease through a secondary term, which is for 2 years and thereafter as long as minerals are produced or mined in paying quantities. If minerals are not extracted in paying quantities, after the secondary term, operators may apply for extensions every 5 years if they meet certain criteria. Leases are limited to a maximum of 640 contiguous acres.

Requirements for Keeping a Lease

A lease can be held if the mine is producing minerals.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate for special minerals, which include precious and semiprecious stones, uranium, thorium, and plutonium, was based on net smelter returns and was assessed at a rate of no less than 5 percent of gross returns. The royalty rate for nonspecial minerals, such as copper and gold, was based on net smelter returns and was no less than 2 percent of gross returns. The severance tax rate for copper, lead, zinc, gold, and silver

was based on net proceeds and ranged from 0.125 percent to 0.5 percent of taxable value. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

In general, smaller, less complex mines submit a reclamation plan, and larger, more complex mines submit a closure plan, according to an official with the State Land Office. Both plans need to cover how the mine will be reclaimed to a self-sustaining ecosystem or postmining land use.

Bonding and Other Financial Assurance Requirements

Operators are required to provide financial assurance in an amount adequate to complete the proposed mine closure plan. The amount is set by the New Mexico Mining and Minerals Division and depends on the reclamation cost estimate provided by the operator, among other factors. Bonds range from \$2,000 to \$25,000.

The amount of financial assurance is to be adjusted to account for certain changes, such as when future reclamation costs change. The Division may specify periodic times or set a schedule for reevaluating and adjusting the financial assurance amount. Common financial assurances are accepted, such as cash, letters of credit, and trusts. Property is also accepted.

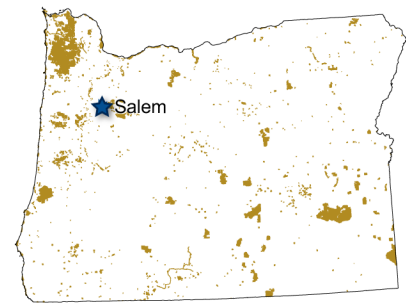


Diatomaceous earth mine in southeast Oregon

Source: Oregon Department of State Lands. | GAO-21-298

Hardrock Mining on Oregon State Trust Lands

Some of Oregon's principal minerals include cement, diatomite, perlite, and crushed stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Oregon was approximately \$530 million in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Oregon became a state in 1859, and federal law stipulated that Oregon receive township sections 16 and 36 to benefit schools (see fig. 3). The Oregon Department of State Lands (State Lands) manages the Common School Fund Trust Lands, according to State Lands officials. Oregon owns approximately 1.7 million acres of land, including trust lands, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

The Oregon Department of State Lands is the administrative arm of the State Land Board (board). The board, composed of three members, is responsible for managing lands under its jurisdiction, such as trust lands, to obtain the greatest benefit for the people of Oregon, consistent with resource conservation and sound land management. This includes mining lease administration.

The State Department of Geology and Mineral Industries increases understanding of Oregon's geologic resources and hazards through science and stewardship. It also oversees mining operations and reclamation.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Prospect and Explore

An operator must obtain a prospecting permit to conduct mechanized exploration on trust lands under 1 acre or

drilling to a depth under 50 feet, or an exploration permit to conduct exploration activities that exceed these thresholds, according to officials with the Oregon Department of Geology and Mineral Industries.

Acquiring a Permit

Operators need to file, with the State Department of Geology and Mineral Industries, a notice of intent to submit an application for a mining operation permit. They must post copies of the notice along the perimeter of the location of the proposed operation.

Permit Duration and Acreage Limitations

Prospecting permits expire 3 years from the date of issuance. In the event that the operator does not discover minerals during the initial term of an exploration permit, the permit may be renewed for an additional 3 years if certain criteria are met. There are no acreage limitations set on exploration activities, according to officials with the Oregon Department of Geology and Mineral Industries.



Mine Development

Leasing

Operators must obtain a lease from the Department of State Lands Industries before engaging in surface mining. Any qualified applicant wishing to obtain an original, amended, or renewed mining lease needs to submit a written application to the Department of State Lands. Competitive bidding may be used to lease discovered minerals. Board approval to lease may be required based on mineral value.

Other Required Approvals

Federal, state, and local government approvals may be required for mine development, such as permits related to operations, safety, and water quality.

Assessing Environmental Impacts

Environmental reports are required.

Multiple Minerals Covered by Leases

Multiple minerals may be included in a lease, according to officials with the Oregon Department of Geology and Mineral Industries.

Lease Term and Acreage limitations

Leases are issued for a primary term of 10 years. The operator may renew the lease for successive 10-year terms if certain conditions are met, up to a maximum of 50 years. Leases are limited to a maximum of 640 acres.

Requirements for Keeping a Lease

Operators must pay an annual rental fee and incur expenses developing minerals. Lease renewals are possible, up to a maximum of 50 years, if royalties from minerals produced during any year of the primary term or a succeeding 10-year term equal or exceed twice the annual rental due under the lease.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate for metallic minerals and uranium was based on gross revenue and was assessed at a rate of 5 percent. For nonmetallic minerals, the royalty rate was unit based, and the rate was per ton as determined to be fair and reasonable under the particular lease. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators need to submit reclamation plans to the Department of Geology and Mineral Industries when seeking an operating permit. Using the reclamation estimate and other resources, the Department of Geology and Mineral Industries will make an initial determination as to the amount of the reclamation bond necessary to protect human health and the environment. Operators have the continuing obligation under a lease to pay the cost of the surface reclamation necessitated by the operator's mining operation.

Bonding and Other Financial Assurance Requirements

Bonding is required, and the amount may not be less than \$1,000. Bonds are required in amounts acceptable to the Department of State Lands. For the Department of Geology and Minerals, the amount of financial assurance depends on the mine operation and may be adjusted at any time, based on the actual reclamation liability at the mine site. Common financial assurances are accepted, such as cash, letters of credit, and certificates of deposit.

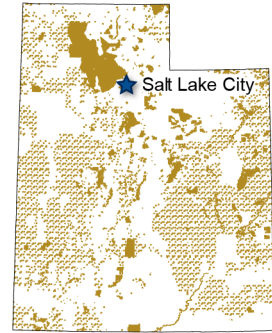


Topaz Mine in western Utah

Source: Utah Division of Oil, Gas and Mining. | GAO-21-298

Hardrock Mining on Utah State Trust Lands

Some of Utah's principal minerals include copper, magnesium metal, and salt, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Utah was approximately \$2.9 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Utah became a state in 1896, and federal law stipulated that Utah receive township sections 2, 16, 32, and 36 to support schools and other public institutions (see fig. 3). Utah owns approximately 5.4 million acres of land, including trust lands, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

The Utah School and Institutional Trust Lands Administration (SITLA) has a seven-member board responsible for mining lease administration on state trust lands.

The Division of Oil, Gas and Mining and Board of Oil, Gas and Mining (Minerals Program) within the Department of Natural Resources is responsible for issuing rules to carry out the Utah Mined Land Reclamation Act as well as enforcing the act. A board consisting of seven members who are appointed by the Governor and generally serve 4-year terms is the policy-making body for the Minerals Program.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Before mining begins, a notice of intent to explore—for operations on 10 acres or more—must be filed and approved.

Acquiring a Permit

The operator must obtain a permit from the Utah Division of Oil, Gas and Mining for permission to mine on state trust lands.

Permit Duration and Acreage Limitations

Notices of intent to explore expire on December 31 of the year following the year of submittal but can be extended. The primary term of a permit is 10 years and can be renewed indefinitely as long as the operator meets certain criteria. Each permit is generally limited to no more than 2,560 acres.



Mine Development

Leasing

Leases are offered for auction on a quarterly basis, according to a National Association of State Trust Lands representative. If no bid is offered, individuals can apply for a lease by going into the SITLA office.

Other Required Approvals

Federal, state, and local government approvals may be required for mine development, such as permits related to air quality, operations, and water quality.

Assessing Environmental Impacts

An operator is to provide a general narrative description identifying potential surface and subsurface environmental impacts.

Multiple Minerals Covered by Leases

Leases may be issued for different types of minerals on the same trust land.

Lease Term and Acreage Limitations

The primary term of a lease is 10 years and can be renewed indefinitely as long as the operator meets certain criteria. Leases are limited to no more than 2,560 acres or four township sections, unless approved by the Director of SITLA.

Requirements for Keeping a Lease

A lease can be renewed after the primary term expires, as long as the mineral is being produced in paying quantities or the Director of SITLA determines the leaseholder is engaged in diligent operations, exploration, or development; has made substantial financial investments; and pays the minimum royalty set forth in the lease.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate was based on gross revenue at a rate of 8 percent. The severance tax rate for metals and metalliferous minerals was based on net proceeds and was 2.6 percent of taxable value. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

Operators need to submit and receive approval for a plan of operations prior to any surface disturbance, drilling, or other operations that disturb the surface of trust lands subject to a lease or permit. The plan of operations is to include, at a minimum, proposed access and infrastructure locations and proposed site reclamation.

Bonding and Other Financial Assurance Requirements

Operators are required to provide financial assurances. The amount varies by mine site and, depending on the size of the mining operation and the situation, can be site specific or based on the average dollars per acre.

Common financial assurances are accepted, such as cash, bonds, and collateral. In some cases, written self-bonding agreements may also be accepted. A Utah mining official said that written self-bonding agreements are rare and must be approved by the Board of Oil, Gas and Mining after operators provide thorough financial information to demonstrate that self-bonds are possible.

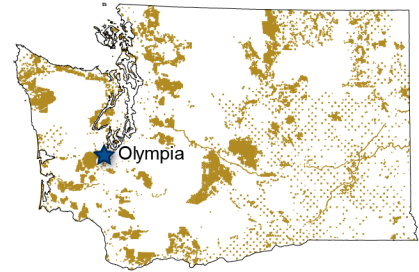


Spotted Deer Mine in southwest Washington

Source: Washington Department of Natural Resources. | GAO-21-298

Hardrock Mining on Washington State Trust Lands

Some of Washington's principal minerals include raw materials for cement, diatomite, and stone, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Washington was approximately \$1.1 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Washington became a state in 1889, and federal law stipulated that Washington receive townships 16 and 36 to support schools and other public institutions (see fig. 3). Washington owns approximately 3.8 million acres of land, including trust lands, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

Three entities within the state Department of Natural Resources (Department) play a role in managing mining on state trust lands:

- The six-member Board of Natural Resources (board) is responsible for setting policies to guide how the Department manages the state's lands, including trust lands, and resources.
- The Product Sales and Leasing Division is responsible for mining lease issuance and administration.
- The Washington Geological Survey's Surface Mine Reclamation Program makes sure that state lands, including trust lands, and waters are protected and reclaimed after mining is complete. It regulates permitted and unpermitted surface mines statewide and monitors surface mines.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

Operators obtain a mineral prospecting lease, which grants the operator the right to explore on that state trust land but not the right to extract minerals for commercial sale or use.

Acquiring a Lease or Permit

Two different authorizations may be required.

- The first involves operators submitting an application to the Department's Product Sales and Leasing Division to obtain a mineral prospecting lease.
- The second involves operators consulting with the Department's Surface Mine Reclamation Program to determine whether a surface mine reclamation permit for exploration may also be required, if certain thresholds are met (such as if the disturbed area is larger than 1 acre in an 8-acre segment).

Permit or Lease Duration and Acreage Limitations

Mineral prospecting leases may be for a term of up to 7 years from the date of the lease. After 7 years, any prospecting lease not converted to a mining contract (discussed below) is not renewable, and the holder of an expired prospecting lease cannot seek a new lease on the same area for 1 year from the date of the expired lease.

There is a maximum of 640 acres for mineral prospecting leases; however, for exploration permits, there is no upper acreage limit, according to Washington Geological Survey officials.

Requirements for Keeping a Prospecting Lease

An operator needs to perform annual prospecting work valued in cost amounts set by the Board of Natural Resources. The operator may make a payment to the Department of Natural Resources in lieu of the performance of annual prospecting work for up to 3 years during the term of the lease. Prospecting work performed

must contribute to the mineral evaluation of the leased premises.



Mine Development

Mining Contracts

A mineral prospecting lease gives the operator a preference right to a mining contract, which is required before extracting minerals. A mining contract is similar to what some other western states refer to as a lease. It is an agreement that outlines the terms for use of the lands, such as duration of use and any acreage limitations, according to a Washington State Department of Natural Resources official.

Other Required Approvals

Federal, state, and local government approvals may be required for mine development, such as permits related to air quality, hazardous waste, safety, and water quality.

Assessing Environmental Impacts

An environmental review is required for any proposed metals mining and milling operation.

Multiple Minerals Covered by Leases and Contracts

In many cases, mineral prospecting leases and mining contracts cover a target mineral as well as accessory minerals within the same deposit, according to a Washington State Department of Natural Resources official.

Mining Contract Term and Acreage Limitations

Mining contracts are issued for a 20-year term and may be renewed for a subsequent 20-year term. There is a maximum of 640 acres for mining contracts.

Requirements for Keeping a Mining Contract

Mining contracts are generally to require that the operator perform the required annual development work that contributes to the mineral development of, and production from, the property. The operator may make payments to the Department in lieu of the performance of development work.



Mineral Production

Government Royalties or Taxes

As of July 2019, the royalty rate was based on net smelter returns at a rate of 5 percent. The business tax rate was

based on gross revenue and was 0.48 percent of the value of products and byproducts extracted for use or sale. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

An operator applying for a mining contract needs to submit to the Department's Product Sales and Leasing Division a plan of operations, including plans for development and production, as well as for reclamation of the property. An operator needs to submit to the Department's Surface Mine Reclamation Program a reclamation plan prior to obtaining a surface mine reclamation permit.

Bonding and Other Financial Assurance Requirements

The Department's Product Sales and Leasing Division requires a bond for the mining contract, and a separate bond is required by the Surface Mine Reclamation Program for the surface mine reclamation permit. For each proposed mine, the amount is set by the Department. For mining contracts, the amount of the financial assurances required may be reduced or increased because of operational changes at the mine site.

Common financial assurances are accepted, such as cash, letters of credit, and savings certificates. Alternatively, approved participants may join a security pool if one is established. However, at the time of our review, officials said there is no security pool option available.

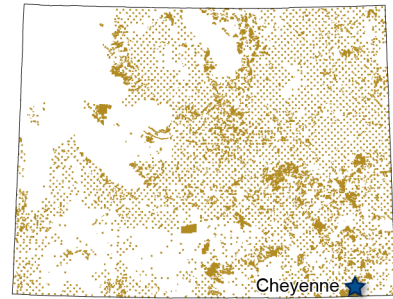


Bentonite mine in northern Wyoming

Source: Wyoming Office of State Lands and Investments. | GAO-21-298

Hardrock Mining on Wyoming State Trust Lands

Some of Wyoming’s principal minerals include the raw minerals for cement, clay, and soda ash, according to a U.S. Geological Survey (USGS) Mineral Commodity Summaries 2019 report. The report also said that the total value of hardrock mineral production on all lands (federal, state, and private) in Wyoming was approximately \$2.4 billion in 2018.



State lands (such as trust lands and state parks)

Sources: 2018 USGS Protected Areas Database of the U.S., U.S. Census Bureau, and MapInfo. | GAO-21-298

Governance Structures for Managing Mining

Land Ownership and Governance Structures

Wyoming became a state in 1890, and federal law stipulated that Wyoming receive township sections 16 and 36, but the Supreme Court found that neither its enabling act nor its Constitution imposed trust responsibilities (see fig. 3). Despite this finding, the Supreme Court found that Wyoming’s state legislature instructed lands to be held in trust for the benefit of public institutions such as schools, hospitals, and prisons. Wyoming owns approximately 4.1 million acres of land, including trust lands, according to 2018 USGS and U.S. Census Bureau data. The following discussion covers hardrock mining on state trust lands.

The five-member State Board of Land Commissioners (board) within the Wyoming Office of State Lands and Investments is responsible for issuing and administering mineral leases.

The Land Quality Division within the Wyoming Department of Environmental Quality (Department) is responsible for permitting mining operations, establishing the reclamation bond, and ensuring that any land disturbances resulting from mining are reclaimed to an approved postmining land use.

Approaches for Managing Mining by Stage



Mineral Exploration

Authority to Explore

If individuals want to conduct limited duration and noninvasive mineral surveying on state trust lands, they may submit an application to the board and provide a surface impact payment. Operators must also obtain a license to explore by bulldozing or a mining permit from the Department to explore for minerals on state trust lands.

Acquiring a License or Permit

Written applications for licenses or permits need to be submitted to the Office of State Lands and Investments. All applications for licenses or permits are subject to approval by the board, according to a Wyoming Office of State Lands and Investments official.

License or Permit Duration and Acreage Limitations

Licenses to explore are issued for a 1-year period, and operators must either reclaim the lands, including state trusts lands, or file a renewal application before the end of the annual period. If the proposed exploration program will affect 40 acres or more within four contiguous sixteenth-of-a-square-mile sections, then the applicant must obtain a mining permit rather than a license to explore. Licenses or permits are limited to a maximum of 640 acres, according to a Wyoming Office of State Lands and Investments official.



Mine Development

Leasing

Mineral leases are acquired by submitting a complete lease application and receiving application approval by the board. To be qualified to receive or hold any interest in a state lease, corporations, limited partnerships, and limited liability companies must be authorized by the Secretary of State to transact business in the state of Wyoming.

Other required approvals

Federal, state, and local government approvals may be required for mine development, such as permits related to air quality, safety, and water quality.

Assessing Environmental Impacts

Environmental studies are required for the development of leases.

Multiple Minerals Covered by Leases

Different hardrock minerals require separate leases, according to a Wyoming Office of State Lands and Investments official. Each mineral is listed under specific lease types.

Lease Term and Acreage Limitations

Leases are issued for a primary term of 10 years, with an opportunity to extend in 10-year increments if certain conditions are met. The minimum acres that can be leased per application is 40 acres, and the maximum is 640 acres.

Requirements for Keeping a Lease

Leases are held as long as the mining operations and operator meet certain conditions, such as complying with rules, regulations, and financial obligations.

Leases may be renewed in 10-year increments beyond their primary term if, among other things, operators are proceeding with good faith to develop the leased lands, such as making substantial expenditures or firm commitments for exploration, engineering, or environmental studies, or minerals are being produced from the land, including state trust lands, and the operator is complying with all lease terms.



Mineral Production

Government Royalties or Taxes

As of July 2019, the default royalty rates for metallic and nonmetallic rocks and general minerals were based on gross revenue and were 5 percent to 10 percent, based on sales value per ton. For the same categories, the minimum royalty rate was unit based and was \$0.50 per ton. The

mining severance tax rate was based on modified net smelter returns and was 2 percent of the gross product's value. (See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, for more detailed information.)



Reclamation

Reclamation and Mine Closure Plan Requirements

The Department of Environmental Quality (Department) requires reclamation plans and reclamation bonds that are calculated annually, according to a Department official. When mining operations are completed, reclamation is to restore the land to a condition equal to or greater than the highest previous use.

Bonding and Other Financial Assurance Requirements

Bonding is required through both the Office of State Lands and the Department. Bonds are a minimum of \$10,000 per lease. There are multiple lease types, which are based on mineral types, and each lease type has specific rules and regulations pertaining to bonding. The Office of State Lands determines the sufficient bond amounts for its leases and may adjust the amount at any time, as conditions may require.

Common financial assurances are accepted, such as cash, letters of credit, certificates of deposit, and self-bonding—if the applicant can demonstrate third-party credit rating solvency.

Appendix V: Topics To Be Included in Minerals Agreements for Mining on Tribal Trust and Restricted Fee Lands

The Indian Mineral Development Act of 1982's implementing regulations specify the topics that minerals agreements, as defined by regulation, must address, if applicable, including those listed in table 7.¹ To help ensure that these topics are addressed, the Bureau of Indian Affairs within the Department of the Interior uses a similar checklist of topics to be included in developing minerals agreements.

Table 7: Topics to Be Included in Minerals Agreements for Mining on Tribal Lands

Topics
General statement identifying the parties to the agreement
Duration of the agreement
Statement indemnifying the tribe and the U.S. from all claims, liabilities, and causes of action that may arise from persons who are not a party to the agreement
Obligations of the contracting parties
Methods of disposition of production
Method and amount of compensation to be paid
Accounting and mineral valuation procedures
Operating and management procedures
Limitations of assignments, including the tribe's right of first refusal
Bond requirements
Insurance requirements
Audit procedures
Dispute resolution
Force majeure provision (provision that frees both parties from the agreement if an extraordinary, unforeseeable, and unavoidable event prevents one or both parties from performing)
Rights of the parties to terminate or suspend the agreement
Procedures to follow if terminated or suspended
Nature and schedule of activities to be conducted
Proposed manner and time of performance of abandonment, restoration, and reclamation activities
Reporting production and sales

¹The regulatory definition of a minerals agreement is any joint venture, operating, production sharing, service, managerial, lease (other than a lease entered into pursuant to the Indian Minerals Leasing Act or the Act of March 3, 1909), contract, or other minerals agreement providing for the exploration for, or extraction, processing, or other development of minerals in which an Indian mineral owner owns a beneficial or restricted interest, or providing for the sale or other disposition of the production or products of such minerals. 25 C.F.R. § 225.3.

**Appendix V: Topics To Be Included in Minerals
Agreements for Mining on Tribal Trust and
Restricted Fee Lands**

Topics

Unitizing or communitizing lands (mining an area as a single unit, without regard to ownership)

How lands will be protected from drainage and minerals will be protected from unauthorized taking

Record-keeping

Sources: Information from the Department of the Interior's Division of Energy and Mineral Development and GAO analysis. | GAO-21-298

Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact

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Staff Acknowledgments

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Related GAO Products

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