



441 G St. N.W.
Washington, DC 20548

May 28, 2020

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

Mining on Federal Lands: More Than 800 Operations Authorized to Mine and Total Mineral Production Is Unknown

Dear Chairman Grijalva:

Solid minerals, such as copper and phosphate, play an important role in the U.S. economy by contributing to multiple industries, including transportation, defense, and aerospace. The Department of the Interior’s (Interior) Bureau of Land Management (BLM) and the Department of Agriculture’s Forest Service manage federal lands on which some of these minerals are produced.¹ Because mining by its very nature disturbs the land and creates the potential for serious public health, safety, and environmental hazards, these two agencies oversee mine operations to help prevent, mitigate, or manage these hazards. As part of this oversight responsibility, BLM and the Forest Service evaluate proposals to mine on federal lands and authorize the production of minerals extracted from these lands.

Federal lands are comprised of public domain and acquired lands. In general, acquired lands are those granted or sold to the United States by a state or citizen; public domain lands usually were never in state or private ownership.² 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

¹BLM manages over 240 million acres of public lands located primarily in the western half of the United States. BLM manages another 700 million acres of subsurface minerals, referred to as the federal mineral estate. Approximately 58 million acres of these federal subsurface lands are located beneath privately-owned lands—a situation commonly known as a split estate. The Forest Service manages approximately 193 million acres of national forests and grasslands throughout the United States.

²Wallis v. Pan Am. Petroleum Corp., 384 U.S. 63, 65 n.2 (1966). The Weeks Act of 1911 authorized the Secretary of Agriculture to purchase such forested lands that in his judgment may be necessary to the regulation of the flow of navigable streams or for the production of timber. 16 U.S.C. § 515. Under the Weeks Act, national forests were established or expanded in 25 eastern states. Forest History Society, “The Weeks Act: Impact and Legacy,” accessed March 24, 2020. <https://foresthistor.org/research-explore/us-forest-service-history/policy-and-law/the-weeks-act/impact-and-legacy/>.

³Congressional Research Service, *Federal Land Ownership: Overview and Data*, R42346 (Washington, D.C.: Feb. 20, 2020).

Different statutes and systems govern the management of solid minerals on public domain and acquired lands. For purposes of this report, we group these minerals and their associated mine operations⁴ into four categories:

- **Locatable hardrock minerals.** Hardrock minerals authorized under the location system include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872.⁵ This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty. BLM and the Forest Service each maintain separate programs to evaluate and approve the locatable hardrock operations on the lands they manage.
- **Leasable hardrock minerals.** Hardrock minerals authorized under a leasing system refers to minerals such as gold, silver, and copper that are generally found on lands acquired by the Forest Service under the Weeks Act.⁶ BLM administers a leasing system for these minerals. In general, leasing systems allow 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.
- **Non-energy solid minerals.** Non-energy 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 1947.⁷ Individuals may extract these minerals using a leasing system administered by BLM.
- **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 administered by BLM. Interior's Office of Surface Mining Reclamation and Enforcement or an approved state agency regulates coal mine operations.⁸

You asked us to review mining on federal lands. This report identifies (1) the number of operations authorized to produce solid minerals on federal lands as of September 30, 2018, and selected characteristics of those operations, and (2) the federal royalties obtained from and quantity of solid minerals produced on federal lands for fiscal year 2018. We also have ongoing work examining hardrock mining systems and stakeholder views of the systems.

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.

⁵30 U.S.C. § 22 et seq.

⁶The Act of March 4, 1917, authorized the Secretary 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 Interior. 60 Stat. 1097, 1099-1100 (1946).

⁷Mineral Leasing Act for Acquired Lands of 1947, 61 Stat. 913 (1947) (codified as amended at 30 U.S.C. §§ 351–359); Mineral Leasing Act of 1920, 41 Stat. 437 (codified as amended at 30 U.S.C. § 181 et seq.).

⁸The surface effects of coal mining in the United States are regulate under the Surface Mining Control and Reclamation Act (SMCRA), which also created the Department of the Interior's Office of Surface Mining and Enforcement to administer the act. 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.

To determine the number of operations authorized to produce solid minerals on federal lands and their selected characteristics, we reviewed and analyzed information from agency data systems including BLM's Legacy Rehost 2000 (LR2000) and Alaska Case Retrieval and Enterprise System and the Forest Service's Natural Resource Manager. Specifically, we collected and analyzed information on mine operations that agencies had authorized to produce minerals from the federal mineral estate as of September 30, 2018, the most recent data available at the time of our review. We excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

We also collected and analyzed information on selected characteristics of the mine operations, including the mineral type, whether the operation was managed and authorized using the location or a leasing system, associated surface acres,⁹ the primary commodity being extracted by the mine operation,¹⁰ the U.S. state in which the operation was located, and the federal lands on which the operation occurred.¹¹

We interviewed BLM and Forest Service officials and reviewed agency documents such as handbooks and manuals to understand the agencies' data systems and processes. To assess the reliability of the data we collected, we tested agency datasets for reliability and completeness and interviewed officials about any discrepancies we identified. We also requested that BLM and Forest Service officials verify their systems' data with field office officials to confirm the accuracy of certain fields and reconcile data inconsistencies and gaps. We determined the data were sufficiently reliable for the purposes of reporting the number of authorized mine operations on federal lands and information about their selected characteristics.

To determine the federal royalties obtained and quantity of solid minerals produced on federal lands for fiscal year 2018, we reviewed and analyzed revenue data from Interior's Office of Natural Resources Revenue (ONRR) and its Solid Minerals Production and Royalty Reporting System. Specifically, we collected available data for each of the mine operations that BLM and the Forest Service identified as authorized to produce minerals as of September 30, 2018. We obtained and analyzed data on the royalties paid by mine operators based on the quantity of minerals produced in fiscal year 2018.¹² We also obtained and analyzed data on the quantity of

⁹For the purposes of this report, we provide the total number of surface acres associated with authorized mine operations. For locatable hardrock operations, agency officials provided us with the total surface acres the operations are authorized to disturb over the life of the mine. Operators do not always disturb the number of acres they are authorized to disturb, according to agency officials. For all leasable operations, agency officials provided us with the total number of acres under lease. According to agency officials, aside from instances where the leasable mineral is developed by surface mining methods (such as coal mines in eastern Wyoming and phosphate mines in southeast Idaho) operations generally disturb a fraction of the leased acreage.

¹⁰Some mine operations extract multiple commodities. For the purposes of this report, we provide the primary commodity associated with each mine operation. Due to the large number of different commodities in agency data, we consolidated commodity names into groups of similar commodities where possible.

¹¹A mine operation can occur over several surface land ownership types. For the purposes of this report, we report the federal lands on which most of the operation occurs.

¹²Due to the complex nature of financial transactions between operators and ONRR, we grouped less commonly known royalty transaction types together for ease of reporting.

primary commodities these operations produced.¹³ We interviewed ONRR officials and reviewed agency handbooks, manuals, and other documents to understand ONRR's data systems and processes. We took steps to assess the reliability of the data we collected, including interviewing agency officials about discrepancies we identified, testing agency datasets for reliability and completeness, and requesting assistance from ONRR officials to reconcile certain data with information provided from BLM's LR2000. We determined the data were sufficiently reliable for the purposes of reporting the federal royalties obtained and quantity of solid minerals produced on federal lands for fiscal year 2018. Details on the characteristics of each of the operations authorized to produce minerals on federal lands as of September 30, 2018, can be viewed on our website.¹⁴

We conducted this performance audit from June 2019 to May 2020 in accordance with generally accepted government auditing standards. 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.

Agency Data Showed 872 Mine Operations Authorized to Produce Solid Minerals on Federal Lands as of September 30, 2018, Most of Which Were Hardrock Operations

BLM and Forest Service data showed 872 mine operations authorized to produce solid minerals on federal lands as of September 30, 2018. Of these mine operations:

- about 83 percent (728) were authorized to produce locatable hardrock minerals,
- about 2 percent (20) were authorized to produce leasable hardrock minerals,
- about 6 percent (50) were authorized to produce non-energy solid minerals, and
- about 8 percent (74) were authorized to produce coal.¹⁵

While 83 percent (728) of the mine operations fell under the location system, the remaining 17 percent (144) of operations were managed using leasing systems. Specifically, the agencies manage all leasable hardrock mineral, non-energy solid mineral, and coal operations using leasing systems.

Regarding the federal lands on which these 872 authorized operations occurred,

- about 77 percent (674) occurred on lands managed by BLM,
- about 18 percent (159) occurred on lands managed by the Forest Service,

¹³ONRR uses different units of measurement to report the quantity of individual commodities. For consistency, we converted most commodities to tons.

¹⁴GAO, *Supplemental Material for GAO-20-461R: Data on Solid Mineral Operations on Federal Lands*, [GAO-20-520SP](#) (Washington, D.C.: May 28, 2020).

¹⁵These figures do not add to 100 percent due to rounding.

- about 3 percent (26) occurred on lands managed by both BLM and the Forest Service, and
- about 1 percent (13) occurred on lands managed by other federal agencies or on split estate lands for which BLM manages the subsurface minerals.¹⁶

Table 1 shows the number of mine operations authorized to produce minerals on federal lands by agency and category of mine operations as of September 30, 2018.

Table 1: Number of Mine Operations Authorized to Produce Minerals on Federal Lands, by Agency and Categories of Mine Operations, as of September 30, 2018

Category of mine operation	Number of operations authorized to produce on Bureau of Land Management (BLM) lands	Number of operations authorized to produce on Forest Service lands	Number of operations authorized to produce on both BLM and Forest Service lands	Number of operations authorized to produce on split estate lands ^a and other federal lands
Locatable hardrock ^b	589	131	7	1
Leasable hardrock ^c	1	18	0	1
Non-energy solid ^d	37	8	4	1
Coal ^e	47	2	15	10
Total	674	159	26	13

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: We excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

^aSplit estates are lands where the surface is privately owned but the subsurface minerals are federally owned and managed by BLM.

^bLocatable hardrock minerals include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

^cLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^dNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^eCoal on federal lands may be mined under a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

These mine operations also varied by other key characteristics, such as acres authorized for surface disturbance, types of commodities, and location.

Surface acres associated with authorized operations. Combined, about 1.3 million surface acres on federal lands were associated with operations authorized to produce locatable and

¹⁶These figures do not add to 100 percent due to rounding.

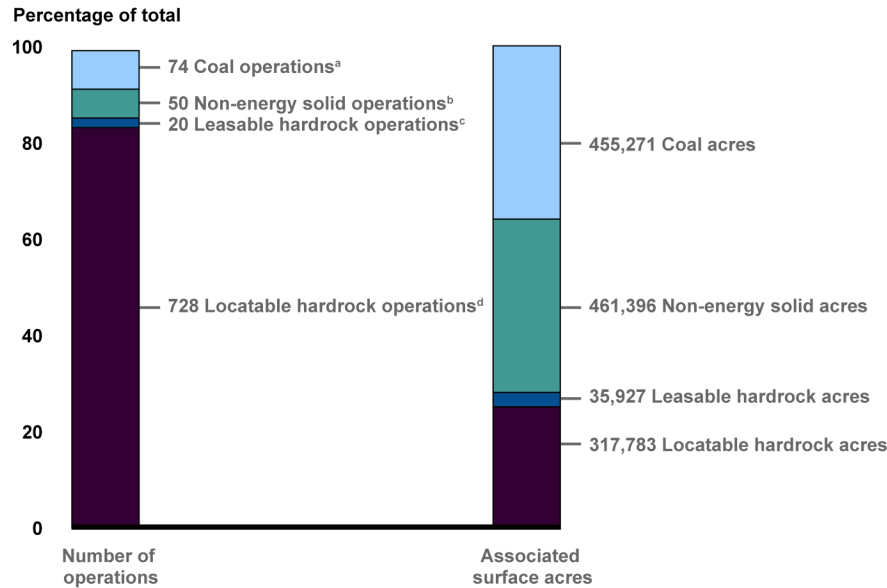
leasable hardrock minerals, non-energy solid minerals, and coal.¹⁷ Specifically, agency data showed that as of September 30, 2018:

- locatable hardrock mineral operations accounted for about 25 percent (317,783) of the total associated acres,
- leasable hardrock mineral operations accounted for about 3 percent (35,927) of the total associated acres,
- non-energy solid mineral operations accounted for about 36 percent (461,396) of the total associated acres, and
- coal operations accounted for about 36 percent (455,271) of the total associated acres.

Different minerals occur in different geologic environments and distribution, and the amount of surface disturbance necessary to extract them may vary. For example, most (about 77 percent) authorized coal operations had more than 1,000 associated surface acres per operation. In contrast, most (about 91 percent) of authorized hardrock mineral operations had fewer than 1,000 associated surface acres. In Alaska, where the primary commodity for almost all operations was gold, nearly half were authorized to disturb 0.5 acres or fewer. According to an agency official, most of these operations use a process called placer mining to remove minerals from river and stream beds. Figure 1 shows the number of mine operations authorized to produce minerals and associated surface acres on federal lands as of September 30, 2018, by category of mine operations.

¹⁷Most operations authorized to produce gold on BLM-managed lands in Alaska progressively disturb areas along the stream beds where deposits occur. For these operations, we report acreage authorized for disturbance in fiscal year 2018.

Figure 1: Number of Mine Operations Authorized to Produce Minerals and Associated Surface Acres on Federal Lands, by Category of Mine Operations, as of September 30, 2018



Sources: GAO analysis of data from the Bureau of Land Management and the Forest Service. | GAO-20-461R

Note: Associated surface acres represents the total number of acres associated with authorized mine operations. For all locatable hardrock operations, we report total surface acres the operations are authorized to disturb over the life of the mine. Operators do not always disturb the number of acres they are authorized to disturb, according to agency officials. For all leasable operations, agency officials provided us with the total number of acres under lease. According to agency officials, aside from instances where the leasable mineral is developed by surface mining methods (such as coal mines in eastern Wyoming and phosphate mines in southeast Idaho) operations generally disturb a fraction of the leased acreage. We excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals but that were closed as of the end of fiscal year 2018.

^aCoal on federal lands may be mined under a leasing system administered by the Bureau of Land Management (BLM). The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

^bNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^cLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^dLocatable hardrock minerals include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

Commodity type by category of mine operations. Gold was the most common primary commodity authorized for production for hardrock mineral operations (locatable and leasable), accounting for about 47 percent of those operations, as of September 30, 2018, according to agency data. Clay, gemstones,¹⁸ and uranium were the next most common primary hardrock commodities authorized for production, accounting for about 11 percent, 7 percent, and 5 percent, respectively.

¹⁸The term gemstones refers to any mineral or organic material (e.g., turquoise and ruby) used for personal adornment, display, or object of art because it possesses beauty, rarity, and durability.

Among non-energy solid mineral operations, phosphate was the most common primary commodity, accounting for about 34 percent of those operations. Potash was the next most common commodity, accounting for about 22 percent, according to agency data.

Location. The majority of mine operations authorized to produce minerals as of September 30, 2018, were located in the western United States, according to agency data.

- Most locatable hardrock mine operations were authorized to produce in the western United States, with the largest number in Nevada.
- Most of the leasable hardrock operations authorized for production were located in midwestern and southern states.
- Most non-energy solid operations were authorized to produce in the western United States, with over half of the operations in Idaho and Utah. In addition, two operations were authorized to produce in Florida.
- Most coal operations were authorized to produce in the western United States, with some operations in Alabama, Illinois, Kentucky, North Dakota, Oklahoma, and West Virginia.

Table 2 shows the number of mine operations authorized to produce minerals on federal lands by state and category of mine operations as of September 30, 2018.

Table 2: Number of Mine Operations Authorized to Produce Minerals on Federal Lands, by State and Category of Mine Operations, as of September 30, 2018

State	Locatable hardrock ^a	Leasable hardrock ^b	Non-energy solid ^c	Coal ^d	Total
Alaska	77	0	0	0	77
Alabama	0	0	0	1	1
Arkansas	0	6	0	0	6
Arizona	41	0	1	0	42
California	123	1	4	0	128
Colorado	37	0	2	12	51
Florida	0	0	2	0	2
Idaho	33	2	13	0	48
Illinois	0	0	0	1	1
Kentucky	0	0	0	2	2
Minnesota	0	1	0	0	1
Missouri	0	6	0	0	6
Montana	43	1	1	7	52
Nevada	143	0	1	0	144
New Mexico	14	0	7	4	25
North Carolina	0	1	0	0	1
North Dakota	0	0	0	5	5
Oklahoma	0	0	0	7	7
Oregon	64	0	0	0	64

State	Locatable hardrock ^a	Leasable hardrock ^b	Non-energy solid ^c	Coal ^d	Total
South Carolina	0	1	0	0	1
South Dakota	2	0	0	0	2
Utah	55	0	14	13	82
Virginia	0	1	0	0	1
Washington	6	0	0	1	7
West Virginia	0	0	0	1	1
Wyoming	90	0	5	20	115
Total	728	20	50	74	872

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: We excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

^aLocatable hardrock minerals include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

^bLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^cNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^dCoal on federal lands may be mined under a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

Enclosure 1 contains additional information on the number of operations authorized to produce solid minerals on federal lands, by state, commodity, and associated surface acres for each category of mine operations. Enclosure 2 contains additional information about the number of operations authorized and associated surface acres, by mineral category and state.

In Fiscal Year 2018, Mining Operators Paid about \$550 Million in Federal Royalties, and Agencies Do Not Know the Total Quantity of Minerals Produced on Federal Lands

In fiscal year 2018, about half of the 144 authorized leasable operations produced solid minerals and paid about \$550 million in federal royalties, according to agency data.¹⁹ In addition, in fiscal year 2018, mine operators produced at least 300 million tons of minerals consisting of leasable hardrock minerals, non-energy solid minerals, and coal on federal lands. We previously found that federal 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.²⁰ As a result, the total quantity produced from mines on federal lands in fiscal year 2018 is unknown.

¹⁹An authorized mine operation may not produce minerals in a given year for a variety of reasons, according to BLM and Forest Service officials. For example, a mine operator may not produce minerals while working to secure capital to fund the construction or expansion of a mine or working to obtain additional permits or approvals from other federal, state, and local entities. In addition, a mine operator may choose to defer mineral production if commodity prices are too low to allow the operator to turn a profit. In fiscal year 2018, seven leasable hardrock, 22 non-energy solid, and 43 coal operations produced solid minerals on federal lands and paid royalties on production.

²⁰GAO, *Mineral Resources: Mineral Volume, Value, and Revenue*, GAO-13-45R (Washington, D.C.: Nov. 2012).

Federal royalties. In fiscal year 2018, mine operators paid about \$550 million in royalties for solid minerals produced under leasing systems.²¹ Specifically,

- leasable hardrock operations accounted for about 2 percent (\$8.7 million) of total federal royalties,
- non-energy solid mineral operations accounted for about 11 percent (\$58 million) of total federal royalties, and
- coal operations accounted for about 88 percent (\$481 million) of total federal royalties.²²

Under the General Mining Act of 1872, locatable hardrock mineral operations are not required to pay federal royalties.²³

Quantity. In fiscal year 2018, mine operators produced at least 300 million tons of minerals consisting of leasable hardrock minerals, non-energy solid minerals, and coal on federal lands. Specifically,

- leasable hardrock minerals accounted for less than 1 percent of production (about 143,000 tons),
- non-energy solid minerals accounted for over 3 percent of production (about 11.6 million tons), and
- coal accounted for about 96 percent of production (about 290 million tons).

However, federal agencies do not generally collect data on the quantity of minerals extracted from locatable hardrock mine operations—which account for 83 percent of the total number of mine operations authorized to produce minerals on federal lands—because there is no federal royalty that would necessitate doing so. Table 3 shows the total number of operations authorized to produce minerals as of September 30, 2018; the number of operations in production on federal lands; quantity of minerals produced; and royalties by management system and mineral type for fiscal year 2018.

²¹In addition to royalties, mine operators also pay rents, bonuses, and other payments, totaling approximately \$5 million for leasable hardrock, non-energy solid, and coal operations that produced minerals on federal lands in fiscal year 2018. The Mineral Leasing Act of 1920, as amended by the Federal Land Policy and Management Act of 1976, generally directs that half of the proceeds (rents, bonuses, and royalty payments) are to go to the state where the leased land is located or deposits were derived. In addition, mine operations may pay other state royalties and taxes that function as a royalty.

²²These figures do not add to 100 percent due to rounding.

²³While locatable hardrock mineral operations do not pay a federal royalty, annual holding fees (maintenance fees) are paid for the underlying mining claims, and in 2018, these fees totaled about \$71 million. See U.S. Department of the Interior, Bureau of Land Management, *Public Land Statistics 2018*, (Washington, D.C.: Aug. 2019). Additionally, many states charge royalties and taxes on hardrock mine operations on federal lands. See GAO, *Hardrock Mining: Updated Information on State Royalties and Taxes*, B-330854 (Washington, D.C.: July 16, 2019).

Table 3: Number of Mine Operations Authorized to Produce Minerals, Number of Operations in Production, Production, and Royalties by Category of Mine Operations, on Federal Lands

Category of mine operation	Number of operations authorized to produce minerals ^a as of Sept. 30, 2018	Number of operations in production in fiscal year 2018	Production in fiscal year 2018 (tons) ^b	Federal royalties in fiscal year 2018 (dollars)
Leasable hardrock ^c	20	7	143,000	8,711,000
Non-energy solid ^d	50	22	11,562,000	57,937,000
Coal ^e	74	43	290,000,000	480,974,000
Locatable hardrock ^f	728	Unknown	Unknown	0
Total	872	At least 72	At least 301,706,000	547,622,000

Sources: GAO analysis of data from the Bureau of Land Management (BLM), Forest Service, and Office of Natural Resources Revenue. | GAO-20-461R

Note: Data on production and royalties are rounded to the nearest thousand.

^aWe excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

^bThe Office of Natural Resources Revenue uses different units of measurement to report the quantity of individual commodities. For consistency, we converted most commodities to tons. This total does not include 9,182 ticket/pounds of quartz also produced in fiscal year 2018, which could not be converted to tons.

^cLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^dNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^eCoal on federal lands may be mined under a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

^fLocatable hardrock minerals includes minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

See enclosure 3 for production quantity and royalties by commodity type of mine operations in production on federal lands in fiscal year 2018.

Agency Comments

We provided a draft of this product to the Department of Agriculture and the Department of the Interior for review and comment. Both agencies provided technical comments, 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 to the appropriate congressional committees, the Secretary of Agriculture, the Secretary of the Interior, and other interested parties. In addition, the report will be 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 fennella@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs

may be found on the last page of this report. Key contributors to this report were Casey L. Brown (Assistant Director), Ulana Bihun (Analyst-in-Charge), Jessica Blackband, Matt Elmer, Rich Johnson, Ying Long, Patricia Moye, Katrina Pekar-Carpenter, Anne Rhodes-Kline, Rebecca Sandulli, Sheryl Stein, Sara Sullivan, Jack Wang, and Adam Windram.

Sincerely yours,

A handwritten signature in cursive script that reads "Anne-Marie Fennell". The signature is written in black ink and is positioned above the printed name and title.

Anne-Marie Fennell
Director, Natural Resources and Environment

Enclosures – 3

Enclosure 1: Number of Mine Operations Authorized to Produce Solid Minerals on Federal Lands, by State, Commodity, and Associated Surface Acres for Each of the Categories of Mine Operations

This enclosure shows the number of mine operations authorized to produce solid minerals on federal lands as of September 30, 2018 by state, commodity, and associated surface acres for each of the categories of mine operations, including locatable hardrock, leasable hardrock, non-energy solid, and coal. Due to the large number of different commodities in agency data, where possible, we grouped similar commodities. (See tables 4-7.)

Table 4: Number of Authorized Locatable Hardrock Operations on Federal Lands, by State, Commodity, and Associated Surface Acres, as of September 30, 2018

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
Alaska	Gold	76	899 ^d
	Silver	1	350
Subtotal		77	1,249
Arizona	Copper	9	4,224
	Gold	9	248
	Gypsum	2	7
	Iron	1	15
	Limestone	4	300
	Lithium	2	2
	Manganese	1	22
	Perlite	1	5
	Silver	1	6
	Stone ^e	3	48
	Uranium	4	93
	Zeolites	4	62
	Subtotal		41
California	Barite	1	1
	Borate	3	210
	Calcium	1	10,836
	Clay ^e	7	474
	Gemstones	4	11
	Gold	75	11,486
	Gravel ^e	1	480
	Gypsum	5	192
	Iron	2	25
	Limestone	4	162
	Magnesium	1	2
	Mercury	1	40
	Mica	1	30
	Quartz	1	60
	Sand & gravel ^e	1	100
	Silver	1	1
	Stone ^e	2	20
	Talc	2	25
	Unknown	2	6
	Volcanic rock	5	350

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
	Zeolites	3	60
Subtotal		123	24,571
Colorado	Clay ^e	1	5
	Gemstones	6	79
	Gold	14	130
	Gypsum	1	830
	Limestone	3	37
	Silver	1	2
	Stone ^e	1	2
	Uranium	9	203
	Vanadium	1	11
Subtotal		37	1,299
Idaho	Cobalt	1	132
	Diatomite	1	5
	Gemstones	2	10
	Gold	11	7,796
	Limestone	4	274
	Molybdenum	1	770
	Silver	1	1,671
	Stone ^e	5	236
	Travertine	2	22
	Volcanic rock	1	35
	Zeolites	4	36
Subtotal		33	10,987
Montana	Barite	1	6
	Clay ^e	7	5,690
	Gemstones	2	5
	Gold	26	2,710
	Industrial garnet	1	20
	Limestone	1	1
	Platinum	2	110
	Talc	1	100
	Vermiculite	1	4
	Zinc	1	1,500
Subtotal		43	10,146
Nevada	Antimony	1	2
	Barite	6	1,467
	Clay ^e	4	183
	Copper	1	6,867
	Diatomite	5	848
	Gemstones	2	4
	Gold	90	166,277
	Gypsum	5	233
	Limestone	7	1,548
	Lithium	1	620
	Molybdenum	3	10,598
	Perlite	5	104
	Quartz	3	235

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
	Rock salt	1	17
	Shale	1	26
	Silver	2	2,803
	Stone ^e	3	25
	Volcanic rock	2	10
	Zeolites	1	23
Subtotal		143	191,889
New Mexico	Clay ^e	1	10
	Copper	4	535
	Gold	2	30
	Gypsum	1	2
	Limestone	1	50
	Sand & gravel ^e	1	38
	Travertine	2	400
	Uranium	1	640
	Volcanic rock	1	21
Subtotal		14	1,727
Oregon	Aluminum	1	15
	Clay ^e	3	49
	Diatomite	3	9,786
	Gemstones	31	79
	Gold	22	7,298
	Perlite	1	700
	Quartz	1	2
	Stone ^e	1	437
	Zeolites	1	300
Subtotal		64	18,666
South Dakota	Clay ^e	1	288
	Gold	1	1
Subtotal		2	289
Utah	Clay ^e	2	272
	Copper	2	1,424
	Diatomite	2	51
	Gemstones	6	76
	Gold	7	77
	Gypsum	6	53
	Iron	1	5
	Limestone	2	17
	Magnesium	1	320
	Perlite	1	14
	Phosphates	1	24
	Quartz	2	173
	Stone ^e	9	137
	Tungsten	1	5
	Uranium	11	280
	Volcanic rock	1	100
Subtotal		55	3,028
Washington	Barite	1	20

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
	Gold	2	960
	Olivine	1	10
	Quartz	2	260
Subtotal		6	1,250
Wyoming	Clay ^e	59	26,342
	Fluorspar	1	5
	Gemstones	1	1
	Gold	10	13
	Gypsum	4	1,600
	Limestone	1	629
	Stone ^e	2	279
	Uranium	12	18,786
Subtotal		90	47,655
Total		728	317,783

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: Locatable hardrock minerals include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

^aSome mine operations extract multiple commodities. This table lists the primary commodity associated with each mine operation. Due to the large number of different commodities in agency data, where possible, we grouped together similar commodities.

^bWe excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals but that were closed as of the end of fiscal year 2018.

^cFor most operations, we report total surface acres the operations are authorized to disturb over the life of the mine. Numbers may not sum to subtotals or the total due to rounding.

^dMost operations authorized to produce gold on BLM-managed lands in Alaska progressively disturb areas along the stream beds where deposits occur. For these operations, we report acreage authorized for disturbance in fiscal year 2018.

^eUncommon varieties of stone, gravel, and clay may be subject to the General Mining Act of 1872 if the deposits meet certain tests under various judicial and administrative decisions.

Table 5: Number of Authorized Leasable Hardrock Operations on Federal Lands by State, Commodity, and Associated Surface Acres, as of September 30, 2018

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
Arkansas	Quartz	5	417
	Gemstones	1	40
Subtotal		6	457
California	Gold	1	41
Subtotal		1	41
Idaho	Gemstones	1	80
	Gold	1	41
Subtotal		2	121
Minnesota	Limestone	1	5
Subtotal		1	5
Missouri	Lead, zinc, copper	6	33,623
Subtotal		6	33,623
Montana	Gold	1	57
Subtotal		1	57
North Carolina	Olivine	1	158
Subtotal		1	158
South Carolina	Gold	1	1,109
Subtotal		1	1,109
Virginia	Limestone	1	355
Subtotal		1	355
Total		20	35,927

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: Leasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^aSome mine operations extract multiple commodities. This table lists the primary commodity associated with each mine operation. Due to the large number of different commodities in agency data, where possible, we grouped similar commodities.

^bWe excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals but that were closed as of the end of fiscal year 2018.

^cFor all leasable operations, we provide the total number of acres under lease. Numbers may not sum to subtotals or the total due to rounding.

Table 6: Number of Authorized Non-energy Solid Operations on Federal Lands by State, Commodity, and Associated Surface Acres, as of September 30, 2018

State	Primary commodity ^a	Number of operations ^b	Associated surface acres ^c
Arizona	Sodium	1	4
Subtotal		1	4
California	Potash, sodium ^d	1	21,040
	Sodium	2	3,181
	Sodium, brine ^e	1	2,210
Subtotal		4	26,431
Colorado	Sodium	2	14,644
Subtotal		2	14,644
Florida	Phosphate	2	983
Subtotal		2	983
Idaho	Phosphate	13	20,588
Subtotal		13	20,588
Montana	Phosphate	1	1,409
Subtotal		1	1,409
Nevada	Potash	1	2,500
Subtotal		1	2,500
New Mexico	Potash	7	176,791
Subtotal		7	176,791
Utah	Bitumen	10	4,020
	Phosphate	1	7,278
	Potash	3	143,985
Subtotal		14	155,284
Wyoming	Sodium	5	62,763
Subtotal		5	62,763
Total		50	461,396

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: Non-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^aSome mine operations extract multiple commodities. This table lists the primary commodity associated with each mining operation. Due to the large number of different commodities in agency data, where possible, we grouped similar commodities.

^bWe excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

^cFor all leasable operations we provide the total number of acres under lease. Numbers may not sum to subtotals or the total due to rounding.

^dIn a few cases, different leases within the same operation are authorized to produce different primary commodities. For these operations, we list both primary commodities associated with leases in the operation.

Table 7: Number of Authorized Coal Operations on Federal Lands, by State and Associated Surface Acres, as of September 30, 2018

State	Number of operations^a	Associated surface acres^b
Alabama	1	1,610
Colorado	12	80,675
Illinois	1	145
Kentucky	2	3,352
Montana	7	37,222
New Mexico	4	26,072
North Dakota	5	10,713
Oklahoma	7	16,384
Utah	13	80,011
Washington	1	521
West Virginia	1	7,642
Wyoming	20	190,925
Total	74	455,271

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: Coal on federal lands may be mined under a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

^aWe excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for exploration only) and mine operations that had previously been authorized to produce minerals but that were closed as of the end of fiscal year 2018.

^bFor all leasable operations, we provide the total number of acres under lease. Numbers may not sum to the total due to rounding.

Enclosure 2: Number of Mine Operations Authorized to Produce Minerals and Associated Surface Acres, by State, as of September 30, 2018

This enclosure shows the number of mine operations authorized to produce minerals and associated surface acres by state, as of September 30, 2018. (See table 8.)

Table 8: Number of Mine Operations Authorized to Produce Minerals and Associated Surface Acres by State, as of September 30, 2018

State	Hardrock leasables ^a		Hardrock locatables ^b		Non-energy solid ^c		Coal ^d	
	Operations	Associated acres	Operations	Associated acres	Operations	Associated acres	Operations	Associated acres
Alabama	0	0	0	0	0	0	1	1,610
Alaska ^e	0	0	77	1,249	0	0	0	0
Arkansas	6	457	0	0	0	0	0	0
Arizona	0	0	41	5,030	1	4	0	0
California	1	41	123	24,571	4	26,431	0	0
Colorado	0	0	37	1,299	2	14,644	12	80,675
Florida	0	0	0	0	2	983	0	0
Idaho	2	121	33	10,987	13	20,588	0	0
Illinois	0	0	0	0	0	0	1	145
Kentucky	0	0	0	0	0	0	2	3,352
Minnesota	1	5	0	0	0	0	0	0
Missouri	6	33,623	0	0	0	0	0	0
Montana	1	57	43	10,146	1	1,409	7	37,222
Nevada	0	0	143	191,889	1	2,500	0	0
New Mexico	0		14	1,727	7	176,791	4	26,072
North Carolina	1	158	0	0	0	0	0	0
North Dakota	0	0	0	0	0	0	5	10,713
Oklahoma	0	0	0	0	0	0	7	16,384
Oregon	0	0	64	18,666	0	0	0	0
South Carolina	1	1,109	0	0	0	0	0	0
South Dakota	0	0	2	289	0	0	0	0
Utah	0	0	55	3,028	14	155,284	13	80,011
Virginia	1	355	0	0	0	0	0	0
Washington	0	0	6	1,250	0	0	1	521
West Virginia	0	0	0	0	0	0	1	7,642
Wyoming	0	0	90	47,655	5	62,763	20	190,925
Total	20	35,927	728	317,783	50	461,396	74	455,272

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Forest Service. | GAO-20-461R

Note: Associated surface acres represents the total number of acres associated with authorized mine operations. For all locatable hardrock operations we report total surface acres the operations are authorized to disturb over the life of the mine. Operators do not always disturb the number of acres they are authorized to disturb, according to agency officials. For all leasable operations agency officials provided us with the total number of acres under lease. According to agency officials, aside from instances where the leasable mineral is developed by surface mining methods (such as coal mines in eastern Wyoming and phosphate mines in southeast Idaho) operations generally disturb a fraction of the leased acreage. Numbers may not sum to the total due to rounding. We excluded from our review mine operations that had not yet been authorized to produce minerals (e.g., operations authorized for

exploration only) and mine operations that had previously been authorized to produce minerals, but that were closed as of the end of fiscal year 2018.

^aLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^bLocatable hardrock minerals include minerals such as gold, silver, and copper that are subject to the General Mining Act of 1872. This act allows individuals to locate minerals on public domain lands and stake a claim to obtain the exclusive right to extract those minerals without paying a federal royalty.

^cNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^dCoal on federal lands is available through a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

^eMost operations authorized to produce gold on BLM managed lands in Alaska progressively disturb areas along the stream beds where deposits occur. For these operations, we report acreage authorized for disturbance in fiscal year 2018.

Enclosure 3: Fiscal Year 2018 Production Quantity and Royalties of Mine Operations in Production on Federal Lands

This enclosure shows fiscal year 2018 production quantity and royalties of mine operations in production on federal lands. (See table 9.)

Table 9: Fiscal Year 2018 Production Quantity and Revenue of Mine Operations in Production on Federal Lands

Category of mine operation	Commodity	Production quantity (tons)	Federal royalties (dollars)
Hardrock leasables ^a	Lead, copper, zinc ^b	142,684	8,709,715
	Quartz	— ^c	947
Subtotal		142,684^c	8,710,662
Non-energy solids ^d	Bitumen	17,812	1,448,528
	Phosphate	4,579,904	9,349,712
	Potash	2,383,112	12,859,462
	Sodium	4,581,170	34,279,638
Subtotal		11,561,998	57,937,342
Coal ^e	Coal	290,000,112	480,974,434
Subtotal		290,000,112	480,974,434

Sources: GAO analysis of data from the Bureau of Land Management (BLM) and the Office of Natural Resources Revenue (ONRR). | GAO-20-461R

^aLeasable hardrock minerals include minerals such as gold, silver, and copper that may be mined under a leasing system administered by BLM.

^bAccording to BLM data, several operations are authorized to produce lead, zinc, and copper. Because BLM provided three primary commodities for these operations, we provide joint royalty and production information here.

^cONRR uses different units of measurement to report the quantity of individual commodities. For consistency, we converted most commodities to tons. This total does not include 9,182 ticket/pounds of quartz also produced in fiscal year 2018, which could not be converted to tons.

^dNon-energy solid minerals include minerals such as phosphate and sodium that may be mined under a leasing system administered by BLM.

^eCoal on federal lands may be mined under a leasing system administered by BLM. The Department of the Interior's Office of Surface Mining and Reclamation and Enforcement or an approved state agency regulates coal mine operations.

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