Chapter 7 Non-Fuel Minerals

Introduction
Non-fuel minerals mined on public and Indian lands provide vital inputs that are used throughout the economy. Public and Indian lands administered by the BLM and BIA are an important source of many of these minerals. A wide variety of minerals can be classified as “non-fuel”, including precious metals, base metals, industrial minerals, and materials used for construction. The General Mining Law of 1872 declared all valuable mineral deposits in public land to be free and open to exploration and purchase. These minerals may be “located” with a mining claim under the law. “Locatable” minerals include both metallic minerals (gold, silver, lead, copper, zinc, nickel, etc.), nonmetallic minerals (fluorspar, mica, certain limestones and gypsum, heavy minerals in placer form, uranium, bentonite, silica sand, and gemstones) and certain uncommon varieties of minerals (e.g. dimension stone, pumice, pumicite, and cinder deposits). Other minerals include those often used as industrial feedstock such as phosphate, sodium, and potassium. Mineral materials include sand, gravel, dirt, and rock.

No royalties are associated with the production of locatable minerals produced on lands covered by the Mining Law of 1872. Minerals and materials such as phosphate, sodium, potash, sand, gravel, and rock are leased or sold to the public at fair market value.

At the end of FY 2012 there were 406,140 active mining claims on public land. About 50% of these claims are located in Nevada. Most of the value associated with locatable mineral production is attributable to gold which is produced in significant quantities on public lands.

Outputs
Information and trends associated with a number of selected minerals mined on public land are presented below.  

In FY 2012, Interior-lands produced a wide variety of minerals. For example, it is estimated that over 3 million ounces of gold were produced from Federal lands; the average price of gold in 2012 was $1,700 per ounce. The economic contribution estimates associated with non-fuel mineral production are:

- Value added of $13 billion;
- Estimated output of $21 billion; and
- Estimated employment supported of 111,000.

While minerals are generally traded in competitive markets (though some markets may be localized or thin), prices may not incorporate the external costs associated with mining. Nor does the Federal leasing system completely offset these costs, which are primarily associated with the environmental impacts of mining.

53 The source of much of the information on U.S. production, prices, and value of production is USGS Mineral Commodity Summaries, various years.
Table 7-1 presents data over 2003 – 2012 commodities for the minerals produced on federal lands that have sales values exceeding $100 million. In general, data for locatable minerals are not presented because ONRR does not collect sales volume and value data for locatable minerals covered under the 1872 Mining Law. USGS collects data on total U.S. production for most minerals and some of this information is presented below. For minerals where ONRR data is available, in FY 2012, the largest sales values were associated with carbon dioxide ($567 million); soda ash ($833 million); potash ($265 million); and langbeinite ($230 million).54

54 Langbeinite is a potassium magnesium sulfate mineral and is used to produce potash. Potash is an input for many chemicals and fertilizers.
Table 7-1. Sales Values for Selected Minerals Produced on DOI Managed Lands, 2003-2012

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</thead>
<tbody>
<tr>
<td>Carbon Dioxide Gas (CO2) (mcf)</td>
<td>177.18</td>
<td>211.88</td>
<td>260.57</td>
<td>303.57</td>
<td>306.99</td>
<td>440.38</td>
<td>582.28</td>
<td>479.96</td>
<td>572.94</td>
<td>567.13</td>
</tr>
<tr>
<td>Copper (and Cu concentrate)</td>
<td>16.32</td>
<td>42.25</td>
<td>44.86</td>
<td>49.02</td>
<td>57.59</td>
<td>28.01</td>
<td>302.62</td>
<td>237.44</td>
<td>125.12</td>
<td>49.20</td>
</tr>
<tr>
<td>Langbeinite (incl coarse, granular, special std, standard)</td>
<td>70.61</td>
<td>79.70</td>
<td>77.06</td>
<td>41.57</td>
<td>118.10</td>
<td>51.37</td>
<td>333.82</td>
<td>150.24</td>
<td>163.25</td>
<td>230.38</td>
</tr>
<tr>
<td>Lead Concentrate (ton)</td>
<td>21.78</td>
<td>61.82</td>
<td>78.11</td>
<td>104.17</td>
<td>187.71</td>
<td>296.31</td>
<td>130.37</td>
<td>209.73</td>
<td>243.96</td>
<td>175.25</td>
</tr>
<tr>
<td>Muriate of Potash (coarse, granular, standard)</td>
<td>101.75</td>
<td>50.12</td>
<td>121.90</td>
<td>89.93</td>
<td>124.28</td>
<td>163.00</td>
<td>207.52</td>
<td>190.73</td>
<td>253.97</td>
<td>265.25</td>
</tr>
<tr>
<td>Phosphate (concentrate and raw ore)</td>
<td>86.45</td>
<td>68.93</td>
<td>83.27</td>
<td>41.39</td>
<td>42.64</td>
<td>45.73</td>
<td>64.24</td>
<td>163.21</td>
<td>180.12</td>
<td>205.63</td>
</tr>
<tr>
<td>Potash (ton)</td>
<td>89.40</td>
<td>30.00</td>
<td>64.07</td>
<td>(22.45)</td>
<td>85.93</td>
<td>30.08</td>
<td>217.23</td>
<td>113.38</td>
<td>117.76</td>
<td>148.10</td>
</tr>
<tr>
<td>Soda Ash (incl granular)</td>
<td>297.06</td>
<td>204.82</td>
<td>347.19</td>
<td>526.00</td>
<td>625.26</td>
<td>935.37</td>
<td>887.38</td>
<td>884.42</td>
<td>1,004.88</td>
<td>833.43</td>
</tr>
<tr>
<td>Sulfur (incl geothermal)</td>
<td>8.77</td>
<td>10.95</td>
<td>9.79</td>
<td>15.36</td>
<td>7.29</td>
<td>102.02</td>
<td>44.85</td>
<td>23.58</td>
<td>60.80</td>
<td>83.91</td>
</tr>
<tr>
<td>Other minerals</td>
<td>104.27</td>
<td>98.09</td>
<td>86.90</td>
<td>139.25</td>
<td>187.91</td>
<td>151.88</td>
<td>145.88</td>
<td>200.13</td>
<td>267.36</td>
<td>244.42</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,097.86</td>
<td>979.15</td>
<td>1,317.63</td>
<td>1,445.51</td>
<td>1,884.60</td>
<td>2,413.07</td>
<td>3,058.24</td>
<td>2,489.88</td>
<td>3,440.27</td>
<td>2,978.62</td>
</tr>
</tbody>
</table>

Source: ONRR data.
Gold

Production and prices: Figure 7-1 shows U.S. gold production and prices over 2001 – 2012. Prices rose from about $200 per troy ounce to $1,700 per troy ounce over this period. Domestic gold mine production in 2012 was estimated to be 230 metric tons, slightly less than the 234 metric tons produced in 2011.55 In 2012, the value of U.S. gold mine production was about $12.6 billion. This compares to a value of $71.8 billion in 2011. Gold is a locatable mineral under the 1872 Mining Law and thus no royalties are collected on gold mined on public land. Commercial-grade refined gold came from about 2 dozen producers. A few dozen companies, out of several thousand companies and artisans, dominated the fabrication of gold into commercial products.56 The behavior of gold prices and gold production differ from that of other mineral commodities because gold is often used by investors to hedge against inflation, economic or political instability, and/or uncertainty. For example, during the 2008 financial crisis, while the prices for many minerals were falling, gold prices continued to increase. The price of gold is influenced by a diverse set of factors including U.S. macroeconomic conditions and the value of the dollar.

![Figure 7-1. Gold Production and Prices, 2001 – 2012](image)

Source: USGS Mineral Commodity Summaries.

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55 The decreases were mainly from one mine in Nevada and one mine in Utah. These decreases were partly offset by several mines in Nevada that increased the tonnage of ore processed, and one mine in Montana that reached normal operations level after a period of redevelopment in 2010 and 2011. See USGS Mineral Commodity Summaries, Gold. <http://minerals.usgs.gov/minerals/pubs/commodity/gold/mcs-2013-gold.pdf>.

A significant proportion of the gold produced in the U.S. is mined on public land (approximately 40%). In 2012, gold was produced at about 50 U.S. lode mines, a few large placer mines (all in Alaska), and numerous smaller placer mines (mostly in Alaska and in the Western States). Thirty operations yielded more than 99% of the gold produced in the United States. A small amount of gold is recovered as a byproduct of processing base metals, chiefly copper. Nevada accounted for about 75% (142,000 kg) of U.S. gold production in 2012 (as of October 2012). Alaska accounted for a further 12% (22,300) of 2012 U.S. production. Production in other states (AZ, CA, ID, MT, NM, SD, UT, and WA) represented 13% (25,100 kg) of mine production.

Uses: Gold is fabricated into commercial products, used in jewelry making, dental applications, and electronics. Gold is also held for investment purposes.

**Silver**

*Production and prices:* Figure 7-2 shows U.S. silver production and prices over 1999 – 2012. Prices have risen sharply since 1999 from about $5 per troy ounce to $30 per troy ounce in 2012. Domestic silver mine production has declined over the past 13 years. Production in 1999 was about 1,950 metric tons. Production fell to an estimated 1,050 metric tons in 2012, slightly less than the 1,120 metric tons produced in 2011. In 2012, the value of U.S. silver production was about $1.01 billion. This compares to a value of $1.27 billion in 2011. A significant proportion of the value of the silver mined in the U.S. is associated with silver mined on public lands (approximately 35%). No royalties are collected on silver mined on public lands. A portion of the decline in prices and production is related to long-term trend declining industrial demand; a portion is also likely to be related to the recent economic downturn.

*Uses:* Silver’s traditional use categories include coins and medals, electrical and electronics, jewelry and silverware, and photography. In 2012, the estimated uses were electrical and electronics, 35%; coins and medals, 25%; photography, 10%; jewelry and silverware, 8%; and other, 22%.

![Figure 7-2. Silver Production and Prices](source: USGS Mineral Commodity Summaries.)

**Platinum**

*Production and prices:* Almost all of the platinum mined in the U.S. is produced from public lands. Figure 7-3 shows total U.S. quantities mined and prices over 2001-2012. The quantity of platinum mined in 2012 was the same as the quantity mined in 2011, 3,700 kg. However, prices have risen sharply since 2008, from about $350 per ounce in 2007 to about $1580 per ounce in 2012.
**Uses**: The leading demand sector for platinum group metals (PGMs) continued to be catalysts to decrease harmful emissions in both light- and heavy-duty vehicles. PGMs are also used in the chemical sector as catalysts for manufacturing bulk chemicals such as nitric acid and in the production of specialty silicones; in the petroleum refining sector; and in laboratory equipment, including crucibles for growing high-purity single crystals for use in the electronics sector. Also in the electronics sector, PGMs are used in computer hard disks to increase storage capacity, in multilayer ceramic capacitors, and in hybridized integrated circuits. PGMs are used by the glass manufacturing sector in the production of fiberglass, liquid crystal displays, and flat-panel displays. Platinum alloys, in cast or wrought form, are commonly used for jewelry. Platinum, palladium, and a variety of complex gold-silver copper alloys are used as dental restorative materials. Platinum is also often used as a hedging device. The demand for platinum has also been sustained at a high level due to Asian demand for use in catalytic converters.

![Figure 7-3. Platinum Mined and Prices](source)

Source: USGS Mineral Commodity Summaries.

**Soda Ash**

**Production and prices**: Figure 7-4 shows U.S. soda ash production and prices over 1999 – 2012. Prices rose from about $76 per metric ton to $147 per metric ton over this period. Domestic soda ash mine production in 2012 was estimated to be about 10.9 million metric tons, slightly more than the 10.7 million metric tons produced in 2011. Much of, but not all, soda ash is produced from federal lands. In 2012, the total value of U.S. soda ash mine production was about $1.6 billion. The royalty on soda ash produced on public land ranges from 5-8%. In 2012, royalty collections were $41 million, based on a
The sales value of soda ash is about $833 million. The U.S. has the world's largest natural deposit of trona and is the world's second ranked soda ash-producing nation. Of the various sodium compounds and related products affected by the provisions of the Act, soda ash represents at least 80 percent of the total production, sales, and sales revenues. In 2012, the U.S. soda ash industry consisted of five companies. Four of these companies operate five plants in Wyoming that produced soda ash from underground trona ore. One company in California produces soda ash from sodium-carbonate rich brines. Plants in Wyoming and Colorado produce sodium bicarbonate using feedstock from Wyoming.

**Uses:** Soda ash is an important industrial compound used to manufacture chemicals, glass, pulp and paper, soaps and detergents, and many other familiar consumer products. As fast growing economies, India and China are large consumers of soda ash.

![Figure 7-4. Soda Ash Production and Prices](source: USGS Mineral Commodity Summaries)

**Lead**

**Production and prices:** Figure 7-5 shows lead production and prices over 2001 – 2012. Production in 2012 of 345,000 metric tons was slightly higher than the 342,000 metric tons produced in 2011. Most lead is produced on private lands or from federal leases associated with lands managed by the USDA Forest Service. Lead is typically treated as a locatable mineral. One exception is the lead produced from leases in the Mark Twain National Forest in Missouri, the source of 48% of the Nation’s mined lead over

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59 Soda ash is an alkali chemical refined from the mineral trona or naturally occurring sodium carbonate-bearing brines (natural soda ash) or manufactured from one of several chemical processes (synthetic soda ash). The world’s largest deposit of trona is in the Green River Basin of Wyoming.
the past decade. BLM administers leases on Forest Service lands, and ONRR reports a 2012 sales volume of 171,550 tons of lead concentrate. The price of lead has fluctuated over 2001 – 2012 from a low of $0.21 per pound in 2001 to a high of $1.24 per pound in 2007. The average price in 2012 was $1.14 per pound.

Uses: The lead-acid battery industry continued to be the principal user of lead, accounting for about 86% of the reported U.S. However, health and environmental issues associated with the metal have led to substitution with less hazardous materials, such as titanium or zinc in paints. Substitution of plastics has reduced the use of lead in cable covering, cans, and containers. Aluminum, iron, plastics, and tin compete with lead in other packaging and coatings. Tin has replaced lead in solder for new or replacement potable water systems. In the electronics industry, there has been a move towards lead-free solders with compositions of bismuth, copper, silver, and tin. Steel and zinc were common substitutes for lead in wheel weights.

![Figure 7-5. Lead Production and Prices](source: USGS Mineral Commodity Summaries.)

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Economic Contributions and Economic Values
The estimated value added, economic contributions, and employment associated with non-fuel minerals mined on public and Indian lands in FY 2012 are summarized in Table 7-2.

While minerals are generally traded in competitive markets, market prices may not always incorporate the external costs associated with mining. These costs are primarily associated with the environmental impacts of mining. Environmental regulations (including financial guarantees, mitigation and reclamation requirements) may avoid, limit, control, or offset many of these potential impacts, but mining will, to some degree, always alter landscapes and environmental resources.

Market conditions affect the scope and nature of mining and the resulting external costs. For example, high prices tend to stimulate increased production from existing mines, and prospecting for new mines. Technological changes also affect the level and type of activities carried out, and all phases of mining have undergone substantial technological change over the last few decades. Exploration now uses remote-sensing techniques, improved conceptual models, new geochemical and geophysical instrumentation, statistical analyses and visualization of large data sets, and global positioning system capabilities, many of which were unknown two or three decades ago.62 Some of these changes can assist in mitigating environmental impacts. Changes in market conditions also affect the demand and supply of minerals.

Table 7-2. Non-fuel Minerals - Value Added, Economic Contributions, and Employment Supported

<table>
<thead>
<tr>
<th>Mineral type</th>
<th>Estimated Value Added ($ billions)</th>
<th>Estimated Economic Output (number of jobs)</th>
<th>Estimated Employment Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-locatable</td>
<td>3.04</td>
<td>4.97</td>
<td>25,795</td>
</tr>
<tr>
<td>Locatable</td>
<td>10.01</td>
<td>16.08</td>
<td>84,736</td>
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</tbody>
</table>

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